

DEHRADUN MASTER PLAN - 2041 (DRAFT)



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Abbreviations:

1. ABD- Area-Based Development
2. AEZ- Agri Export Zones
3. AHP- Affordable Housing Partnership
4. AMRUT- Atal Mission for Rejuvenation and Urban Transformation
5. APEDA- Agricultural and Processed Food Products Export Development Authority
6. ARV- Annual Rental Value
7. ASI- Archaeological Survey of India
8. ATM- Anytime Water Machine
9. BO- Branch Office
10. BLC- Beneficiary- led Individual House Construction Scheme
11. BRT- Bus Rapid Transit
12. CAGR- Compound Annual Growth Rate
13. CB- Cantonment Board
14. CBD- Central Business District
15. CCMC- Canadian Computer and Management Centre
16. CDP- City Development Plan
17. CLSS- Credit Linked Subsidy Scheme
18. CMP- Comprehensive Development Plan
19. CNG- Compressed Natural Gas
20. CPCB- Central Pollution Control Board
21. CPHEEO- Central Public Health and Environmental Engineering Organisation
22. CPR- Centre for Policy Research
23. CT- Census Town
24. DAV- Dayanand Anglo Vedic
25. DBS- Doon Business School
26. DDUGKY- Deen Dayal Upadhyaya Grameen Kaushalya Yojana
27. DMC- Dehradun Municipal Corporation
28. DMP- Dehradun Master Plan
29. DSCL- Dehradun Smart Cities Limited
30. ER- Elephant Reserve
31. ELU- Existing Land Use
32. EPA- Environment (Protection) Act
33. EV- Electric Vehicle
34. EWS- Economically Weaker Section
35. FAR- Floor Area Ratio
36. FRI- Forest Research of India
37. GAIL- Gas Authority of India
38. GDP- Gross Domestic Product
39. GEMS- Global Environmental Monitoring System
40. GIS- Geographic Information System
41. GoU- Government of Uttarakhand
42. GTF- Ganga Teat Fault
43. HEP- Hydro Electric Power
44. HFT- Himalayan Frontal Thrust
45. HH- Household
46. HIG- High-Income Group
47. IMA- Indian Military Academic
48. ITLS- Intelligent Traffic Light System
49. IIP- Indian Institute of Petroleum
50. IIRS- Indian Institute of Remote Sensing
51. IRC- Indian Road Congress
52. ISBT- Inter State Bus Terminal
53. ISSR- In-Situ Slum Redevelopment Scheme
54. LAA- Land Acquisition Act
55. LAP- Local Area Plan

56. LBSNAA- Lal Bahadur Shastri National Academy of Administration
57. LIG- Lower Income Group
58. LOS- Level of Service
59. MBT- Main Boundary Thrust
60. MDCH- Mixed Development Cross-Subsidized Housing
61. MDDA- Mussoorie Dehradun Development Authority
62. MDR-Major District Road
63. MoEF and CC - Ministry of Environment, Forest and Climate Change
64. MFPI- Ministry of Food Processing Industry
65. MIG- Medium Income Group
66. MINARS- Monitoring of Indian National Aquatic Resources System
67. MNREGA- Mahatma Gandhi National Rural Employment Guarantee Act
68. MLD- Million Litres per Day
69. MSME- Ministry of Micro, Small and Medium Enterprises
70. MSW- Municipal Solid Waste
71. MSWM- Municipal Solid Waste Management
72. MT- Metric Tonnes
73. MTS- Mass Transport System
74. MW- Mega Watt
75. NGRBA- National Ganga River Basin Authority
76. NGO- Non-Governmental Organisation
77. NGT- National Green Tribunal
78. NH- National Highway
79. NHB- National Horticulture Board
80. NIUA- National Institute of Urban Affairs
81. NMCG- National Mission for Clean Ganga
82. NMT- Non-Motorised Transportation
83. NMPB- Natural Medicinal Plant Board
84. NPP- Nagar Palika Parishad
85. NUHHP- National Urban Housing and Habitat Policy
86. NULM- National Urban Livelihood Mission
87. NW-SE- North West- South East
88. ODR-Other District Road
89. OHT- Overhead Tank
90. ONGC- Oil and Natural Gas Limited
91. OUVGL- Optimum Utilization of Vacant Land
92. PCU- Passenger Car Unit
93. PMAY- Pradhan Mantri Awas Yojana
94. PMEGP- Pradhan Mantri Employment Generation Program
95. PNG- Piped Natural Gas
96. PO- Post Office
97. PPP- Public-Private Partnership
98. PSI- People's Science Institute
99. PWD- Public Works Department
100. RAY- Rajiv Awas Yojana
101. RBC- Reinforced Brick Concrete
102. RBM- River Bed Material
103. RCC- Reinforced Cement Concrete
104. ROW- Right of Way
105. RTO- Regional Transport Office
106. SB- Savings Bank
107. SBA- Swachh Bharat Abhiyan
108. SCADA- Supervisory Control and Data Acquisition
109. SCM- Smart City Mission
110. SH- State Highway
111. SLB- Service Level Benchmark
112. Sol- Survey of India

113. SPECS- Society of Pollution and Environmental Conservation Scientists
114. STP- Sewage Treatment Plant
115. STPI- Software Technology Parks of India
116. SUDA- State Urban Development Agency
117. SWM- Solid Waste Management
118. TCPD- Town and Country Planning Department
119. TVC- Traffic Volume Count
120. TWI- The Wildlife Institute of India
121. UDD- Urban Development Department
122. UEPPCB- Uttarakhand Environmental Protection and Pollution Control Board
123. UHUDA- Uttarakhand Housing and Urban Development Authority
124. UJS- Uttarakhand Jal Sansthan
125. UKPCB- Uttarakhand Pollution Control Board
126. ULB- Urban Local Bodies
127. UPJN- Uttarakhand Pey Jal Nigam
128. UPSEB- Uttar Pradesh State Electricity Board
129. UPJVNL- Uttar Pradesh Jal Nigam Limited
130. UPRVUNL- Uttar Pradesh Rajya Vidyut Utpadan Nagar Limited
131. UPPCL- Uttar Pradesh Power Corporation Limited
132. URDPFI- Urban and Regional Development Plans Formulation and Implementation
133. UNESCO- United Nations Educational Scientific and Cultural Organization
134. UNWTO- United Nations World Tourism Organization
135. V/C- Volume Count
136. VHRS- Very High-Resolution Satellite
137. WFPR- Workforce Participation Rate
138. WIHG- Wadia institute of Himalaya Geology
139. WTP- Water Treatment Plant
140. YTF- Yamuna Teat Fault
141. ZDP- Zonal Development Plan

Definitions-

A

1. **Abadi:** 'abadi' or 'village abadi' means such area in a village which, on the date of commencement of this Code, is being used for the purposes of residence of its inhabitants or for purposes ancillary thereto such as sahan and green trees, wells etc. or which may have been or be hereafter reserved for such use. [21]
2. **Access** A clear approach to a plot or a building. [4]
3. **Accident:** Any event that happens by chance or unintentionally like collision of vehicles and injury, damage to property or death to passengers. [43]
4. **Act:** It hereby means relevant act including:
 - The Uttarakhand Urban and Country Planning and Development Act 1973 (Amendment) Act, 2013
 - Uttarakhand (The Uttar Pradesh Municipal Corporation Act, 1959) (Amendment) Act,
 - The Uttarakhand Panchayati Raj Act, 2016
 - The Uttarakhand (The Uttar Pradesh Special Areas Development Authority Act, 1986) Adaption and Modification Order, 2006 (Amedment) Act, 2008
 - The Uttarakhand Building Constructions and Development Byelaws/ Regulations, 2011 (Amendment 2017)
 - Uttarakhand Special Area (Planned Development and Promotion of Tourism) Act, 2013
5. **Addition and/or Alteration:** A change from one occupancy to another, or a structural change including an addition to the area or change in height or the removal of part of building, or any change in the slmclure, such as the construction or removal or cutting into of any wall or pan of a wall- partition, column, beam, joist, floor including a mezzanine floor or other support, or a change to or closing of any required means of access ingress or egress or a change to ftxtures or equipment" as provided in the ByeLaws. [4]
6. **Affordable Housing:** refers housing that is appropriate for the needs of a range of very low to moderate income households and priced so that these households are also able to meet other basic living costs such as food, clothing, transport, medical care and education.
7. **AMRUT:** provides basic services (e.g., water supply, sewerage, urban transport) to households and building amenities in cities which will improve the quality of life for all, especially the poor and the disadvantaged, is a national priority.
8. **Affordable Housing Project:** An affordable housing project can be a mix of houses for different categories with at least 35% of the houses in the project are for EWS category and a single project has at least 250 houses. [77]
9. **Age-sex Pyramid:** The graphical presentation of age-sex structure in the form a pyramid comprising two sets of horizontal bars placed side by side, one showing males and the other females in different age group at 5-years interval. [20]
10. **Agriculture:** It Includes horticulture, farming, raising of crops, fruits, vegetables, flowers, grass, fodder, trees or any other kind of cultivation, daily, animal husbandry, breeding and keeping of live-stock, including donkeys, mules, pigs, fish, poultry and bees; and use of land which is ancillary to the farming of land or any other agriculture purposes, but shall not include the use of land anached to a building for the purposes of a garden to be used alongside such building. [2]
11. **Agro based & food processing Industry:** An industry defined as a set of technoeconomic activities, applied to all the products, originating from agricultural farm, aqua cultural sources, livestock and forests for their conservation, handling and value-addition to make them usable as food, feed, fibre, fuel or industrial raw materials. [46]
12. **Air Pollutant:** Any solid, liquid, or gaseous substance, including noise, present in the atmosphere, due to any process of substances, in such a concentration as may be, or tend to be, injurious to human beings or other living creatures, or plants, or property, or environment. [11]
13. **Alignment:** The ground plan of a road, railway, or waterway. [39]
14. **Allocation of land:** Distribution of land for a specified purpose according to an approved layout plan. [2]

15. **Amenities:** Natural and man-made features in a city or region and include natural landscaped areas, rivers, lakes, open spaces, road, and utilities, facilities, and services. Amenity includes road, water supply, street lighting, drainage, sewerage, public works and such other convenience as the State Government may, by notification in the Gazette specify to be an amenity for the purposes of Uttarakhand Urban and Country Planning and Development Act, 1973. [4]
16. **Amusement Park:** Amusement Park means a permanent indoor or outdoor facility or park where amusement rides are available for use by the public that is located in a city with a population of more than 5 lakhs, encompasses at least 25 acres in surface area, is enclosed with access only through controlled entries, is open for operation more than 120 days in each calendar year, and has security guards on the premises at all times. The term does not include any public or private driveway, street, sidewalk or walkways, parking lot, parking garage, or other parking area. [13]
17. **Anganwari / Anganwari Centre:** Anganwari as space provision at residential housing neighbourhood level is a centre to provide service for children of 0-6yrs age, pregnant women, feeding mothers, etc. under the Integrated Child Development Scheme (ICDS). [2]
18. **Apartment:** These shall include any building or structure in which living quarters are provided for three or more families, living independently of each other and with independent cooking facilities, for example, apartment houses, mansions and Chawls. [14]
19. **Approved Plan:** A plan approved by a competent authority having jurisdiction. [4]
20. **Area of Influence:** The special extent of a central function identified by the interaction between places where such function is located and the places from where people derive its benefits. [2]
21. **Area Plan:** A plan for development of an area consisting of data, text, maps, and other illustrations, pertaining to land use, transportation, utilities, facilities, and services as per provisions of the master plan and zoning and sub-division regulations. [2]
22. **Arterial Roads in Development Area:** They are the primary roads for ensuring mobility function. They carry the largest volumes of traffic and longest trips in a city. These roads are characterized by mobility and cater to through traffic with restricted access from carriageway to the side. [2]
23. **Auditorium:** A building especially designed with all related services and facilities, to serve as an enclosed space to seat audience and a stage for live performances. [4]
24. **Authority or Development Authority:** 'Authority' in relation to the State Area shall be as per the relevant act. [1]
25. **Auto / Taxi Stand:** A premise used for parking of intermediate public transport vehicles on collision basis. [39]
26. **Automobile Service Station:** A premise for sale, repair and servicing of automobiles. [11]
27. **Average Daily Traffic:** The total volume of traffic passing a point or segment of a roadway during a given time period (more than a day and less than a year) divided by the number of days in that time period. [39]

B

28. **Banquet Hall / Barat Ghar / Marriage Palace:** A building exclusively used for holding social functions such as marriage and other such related get-togethers/ activities. Its premises built up or open or both or any part thereof, where accommodation or space is used for marriage, receptions, social gatherings, meetings on regular or periodical or occasional basis and where at least fifty persons can congregate or gather. [3]
29. **Base Map** is a graphic representation at a specified scale of selected fundamental map information; used as a framework upon which additional data of a specialised nature may be compiled.
OR
Base Map: A map serving as the foundation for subsequent planning and design operations, showing all features and characteristics of the area, as per requirements of the plan/project. [2]
30. **Basement/ Cellar:** The lower storey of a building below or partly below the ground level. [14]

31. **Basin:** A geographical area determined by the watershed limit of the system of waters, flowing into the ocean/sea either directly or through another sovereign nation or into a natural lake/depression having no outlet. [16]
32. **Bazaar:** A commercial area in old city core, generally located along a main road in mixed land use pattern, where ground floor, especially the front portion, is shaping and the upper floors are occupied by residential use. [76]
33. **Bio-diversity:** means the variability among living organisms from all sources and the ecological complexes of which they are part and includes diversity within species or between species and of eco-systems. [17]
34. **Biogas Plant:** A biogas plant is the name often given to an anaerobic digester that treats farm wastes or energy crops. It can be produced using anaerobic digesters (air-light tanks with different configurations).[53]
35. **Birth Rate:** Ratio of the number of live births per 1,000 populations in a given year. [20]
36. **Botanical Garden:** A park landscaped with a variety of plant species for exhibition, nature studies and botanical research purposes. [2]
37. **Bottleneck:** A portion of road with lowest capacity along the route due to an obstruction to free-movement of vehicles. [39]
38. **Buffer:** A landscaped area between two zones provided for the purpose of separating two incompatible land uses and curtailing unwanted view, noise, odour, or dust using plants, walls, berms, or other such elements. [2]
39. **Buffer Zone:** Buffer zones are areas created to enhance the protection of a conservation area, often peripheral to it, inside or outside. Within Buffer zones, certain legal and or customary restrictions are placed upon resource use *and/or* is managed to reduce the negative impacts of restrictions on the neighbouring communities.[2]
40. **Building:** 'Building' includes any structure or erection or part of a structure or erection which is intended to be used for residential, industrial, commercial, or other purposes, whether in actual use or not. **Building** shall mean any structure for whatsoever purpose and of whatsoever materials constructed and every part thereof, whether used as human habitation or not including foundation, plinth, walls, floors, roofs, chimneys, plumbing and building services, fixed platforms, veranda, balcony, cornice or projection, part of a building or anything affixed thereto. [3]
41. **Building Bye-laws / Building Regulations:** Building bye-laws here means, the bye-laws mentioned in the Building Construction and Development Regulation, 2011 (Amended in 2015), Uttarakhand. Municipal rules, regulations, and procedures that in the interest of public health, safety, and welfare, ensure minimum acceptable, (i) quality of the design of all types of buildings, (ii) quality of building materials, (iii) structural safety, (iv) provision of sanitation, and (v) other safety and local requirements. [18]
42. **Built Heritage:** should be deemed to mean those buildings, artifacts, structures, areas and precincts that are of historic, aesthetic, architectural or cultural significance and should include natural features within such areas or precincts of environmental significance or scenic beauty such as sacred groves, hills, hillocks, water bodies (and the areas adjoining the same), open areas, wooded areas, etc. It must be recognized that the cultural landscape around a heritage site is critical for the interpretation of the site and its built heritage and thus is very much an integral part of it.
43. **Built-up Area** means the area that is the sum of the carpet area and the area occupied by the walls of the flat.
OR
Built-Up Area: It means such densely populated areas wherein commercial, industrial or residential area has been developed as mixed use horizontally and 'vertically and contains all essential facilities and has been defined as built-up area in the master plan or has been demarcated as such by Authority Board / Competent Authority. In towns not having a master plan or not having a well-defined built up area, the built-up area or whether any land parcel in question falls under the said area or not shall be determined by the competent authority. [3]
44. **Bus Bay:** An additional area designed and designated at a bus stand for buses to pull into to pick up and drop off passengers with a view to minimise disturbance to the flow of traffic. [39]

45. **Bus Depot:** A premises where the public transport buses are parked during the night period after completing all the trips for me day and includes servicing facility and other related infrastructure. [39]
46. **Bus Lane:** A lane of roadway intended primarily for use by buses, either all day or during specified periods. A vehicular right-of-way or portion thereof-often an exclusive lane--reserved exclusively for buses. [41]
47. **Bus Stand:** A Bus Stand is a designated location on a road away from carriage-way to park buses for short time periods for embarkation and disembarkation of passengers.[41]
48. **Bus Stop / Bus Shelter / Transit Stop Shelter:** A small, roofed structure, usually having three walls, located near a street and designed primarily for the protection and convenience of bus passengers. [41]
49. **Bus Terminal:** A premise used by a public or private transport agency to park the buses for short duration to serve the population. It may include the related facilities for passengers.[2]
50. **Burial Ground:** A premise with facilities for burying of dead bodies. [2]
51. **Brick Kiln:** A kiln in which blocks of clay are baked into bricks, bricks are baked or burned.
52. **By-law** means a by-law under the relevant act by Uttarakhand Housing and Urban Development Authority or the Local Development Authority 'with the previous approval of the State Government. [1]

C

53. **Cadastral Map/ Khasra Map:** A map of an area on a scale 1:4000 or below. Showing the property boundaries, dimensions, ownership, and value of all subdivisions of land. [21]
54. **Camping Site:** A premises located in a recreational or tourist zone and provided with all necessary facilities and services for the purpose of short-duration stay in tents or other temporary structures. [48]
55. **Canteen:** A premise used for serving food items to workers in an institution including cooking facilities. It may have covered or open space or both for sitting arrangement. [4]
56. **Cantonment Battalion:** An area notified by central government under The Cantonments Act, 1924. [19]
57. **Capital Expenditure:** The money spent on fixed assets e.g., land, buildings, machinery, and equipment as well as on major public works like roads, bridges, airport, hospitals, schools, and other buildings. [49]
58. **Carpet Area:** The covered area of the usable rooms of a dwelling unit/ at any floor (excluding the area oft the walls).[4]
59. **Carriage way:** The part of road right-of-way designed for movement of vehicular traffic. [41]
60. **Catchment Area:** The area from where the rain water drains into a river or lake. [50]
61. **Central Business District** is generally the central area, the most frequently used and one of the most expensive areas of a city. It is the part of the city that most people go to work and shop, suggesting that it is a business hub of the city. This is particularly seen in big metropolitan cities around the world where their CBDs are the well-used part of the city. [2]
62. **Cell Tower:** It tower houses the electronic communications equipment along with an antenna to Supply cellular communication in a network. A cell tower is usually an elevated structure with the antenna, transmitters and receivers located at the top. [51]
63. **Census:**
64. **Central/ State Government Office:**
65. **Chemical Industry:**
66. **Chief Town and Country Planner:**
67. **Chruch:**
68. **Cinema/ Multiplex:**
69. **City Centre:**
70. **City:**
71. **Cluster:**
72. **Collector Road:**
73. **College:**
74. **Commercial Building:**
75. **Commercial Land Use:**
76. **Commercial Office:**

- 77. **Commercial:**
- 78. **Community Development/ Planning:**
- 79. **Community Hall/ Centre:**
- 80. **Community:**
- 81. **Commute:**
- 82. **Commuter:**
- 83. **Concept Plan:**
- 84. **Conservation:**
- 85. **Convenience Shops:**
- 86. **Coordinate:**
- 87. **Corridor**
- 88. **Courts**
- 89. **Country Planning**
- 90. **Coverage**
- 91. **Cremention Ground**
- 92. **Cottage and Household Industry**
- 93. **Cul-de-sac**
- 94. **Cultivation**
- 95. **Cycle Lane/ Bike Lane**
- 96. **Cycle Track/ Bike Path**

D

- 97. **Dairy Booth:** A kiosk operated by private entity local authority for the distribution of milk and dairy products. [5]
- 98. **Dairy Farm:** A premise with facilities for rearing and processing of dairy products. It may have temporary structures for sheds of cows. [55]
- 99. **Dam:** "Dam" means any artificial barrier and its appurtenant structure constructed across rivers or tributaries thereof with a view to impound or divert water which also include barrage, weir and similar water impounding structures but does not include- (a) canal, aquaduct, navigation channel and similar water conveyance structures; (b) flood embankment, dike, guide bund and similar flow regulation structures. [56]
- 100. **Database:** Information stored on a computer system that can be updated, modified, and retrieved by authorised persons for further analysis and presentation. [5]
- 101. **Deforestation:** The direct human-induced conversion of forested land to non-forested land. [2]
- 102. **Demand:** The quantity of goods/ services required as per accepted norms and standards or need of the people. [57]
- 103. **Demarcation:** Transferring the layout plan on the site by marking the boundaries of land subdivisions. [5]
- 104. **Demography:** The scientific study of characteristics of human population.[20]
- 105. **Density:** (a) In case of spatial distribution, number of persons or things per unit area (i.e., hectare, acre, sq. mile, or sq. km.), (b) In case of population served, number of things or facilities per unit of population (i.e., 100, 1000, 10,000 etc. persons) where depending upon need, the things may include telephone, phone, doctors, schools etc. The residential density expressed in terms of the number of dwelling units per hectare. [4]
- 106. **Department:** means office of the Chief Town and Country Planning Department of Uttarakhand. [1]
- 107. **Design:** Conceptualisation of a thought and its planning. Architectural and/ or engineering details, through plans, elevations, sections, and other graphic presentation, as required for its implementation.[4]
- 108. **Detached Housing:** A plotted housing development where each dwelling unit is located on a plot with setbacks on all its four sides.[14]
- 109. **Developed Land / Developed Area:** A land area ill an urban centre that has been equipped with basic network of infrastructure such as roads, water supply. Sewerage drainage, electricity, and roadside plantation. [3]
- 110. **Development Area:** means any area declared as development area under a relevant act by the State/ Local Development Authority. [1]

111. **Development:** 'Development' with grammatical variations means the carrying out of building, engineering, mining or other operations in, on, over or under land, or the making of any material change in any building or land, and includes re-development and layout and subdivision of any land and 'to develop' shall be construed accordingly. [3]
112. **Development Vision / Goals:** A perception of the future pattern of development based upon anticipated changes, dreams and aspirations that inspires further planning interventions. [2]
113. **Dharamshala/ Ashram:** In Hindi, a building, normally located near religious places or hospitals where rooms are let out for short duration on non-profit basis. It means building used for holding religious meetings and as resting place for religious followers, a place where arrangements are made for stay of a particular community at minimal charge in the form of donation or free of cost. The ownership of such buildings/ plots essentially be of a registered charitable institution and the operation of permissible activities within it shall also be done by it. In the design of such buildings, a maximum of 25 percent of proposed F.A.R may be proposed for single rooms and the rest of the FAR shall be in the form of dormitory (along with common room and toilet). [3]
114. **Digitise:** In GIS, (a) To encode geographic features in digital form as x, y coordinates, (b) The process of using a digitiser to encode the locations of geographic features by converting their map positions to a series of x, y coordinates stored in computer files.[5]
115. **Disaster:** Disaster means a catastrophe, mishap, calamity or grave occurrence in any area, arising from natural or man made causes, or by accident or negligence which results in substantial loss of life or human suffering or damage to, and destruction of property, or damage to, or degradation of environment, and is of such a nature or magnitude as to be beyond the coping capacity of the community of the affected area. [22]
116. **Dispensary:** A premise having facilities for medical advice and provision of medicine, managed by public or charitable institutions. [2]
117. **Dispensary for Pet Animal and Birds / Veterinary Dispensary:** A premise having facilities for medical advice and provision of medicines to pet animals and birds, managed by public or private or charitable institutions.[2]
118. **District:** An administrative division of a state managed by a District Collector. [58]
119. **District Court/ Family Courts:** Premises used for the offices of Judiciary. [9]
120. **District Police Office & Battalion:** A premise having facilities for the offices and military forces.[2]
121. **Drainage System:** A system or a line of pipes, with their fittings and accessories, such as manholes, inspection chambers, traps, gullies, floor traps used for drainage of building or yards appurtenant to the buildings within the same cartilage; and includes an open channel for conveying surface water or a system for the removal of any waste water. [4]
122. **Dwelling Unit:** A single self-contained house with independent access designed and constructed as an independent unit of a residential area. "Dwelling Unit" shall mean an independent housing unit with separate facilities for living, cooking and sanitary requirements. [3]

E

123. **Earthquake:** A natural phenomenon caused by a sudden rupture inside the earth's crust resulting in shaking or movement of its surface which results in damage to life and property depending upon its intensity measured on a IO-point Richter scale. [59]
124. **Eco-industrial Estate/ Industrial Park:** A designated industrial area, developed and managed in an eco-friendly manner where the industries share resources, effluent is treated in a common treatment plant, wastes are recycled and common facilities are jointly looked after. [60]
125. **Ecosystem:** An arrangement of living (plants and animals) and non-living (mountains and minerals) things and the forces (climate and wildfire) that influence them. [61]
126. **Eco-sensitive zones:** are the areas notified by the MoEFCC around Protected Areas, National Parks and Wildlife Sanctuaries.
127. **Eco-tourism:** refers responsible travel to natural areas that conserves the environment, sustains the well-being of the local people, and involves interpretation and education
128. **Educational Building:** A building exclusively used for a school or college, recognized by the appropriate Board or University, or any Other Competent Authority involving assembly

- for instruction, education or recreation incidental to educational use and including a building for such other uses as research institution. It shall also include quarters for essential staff required to reside in the premises, and building used as a hostel captive to an educational institution whether situated in its campus or outside. [4] [3]
129. **Effluent Treahnent Plant (ETP):** ETP is a Waste Water Treatment Process (WWTP) that is used to treat wastewater. It is mostly used in industries like pharmaceuticals, textiles, and chemicals where extreme water contamination is a possibility. ETP plays a significant role in treatment of industrial wastewater & domestic sewage. [60]
130. **Electricity Grid:** means the high voltage backbone system of inter-connected transmission lines, sub-stations and generating plants. [23]
131. **Electric Sub-station:** means a station for transforming or converting electricity for the transmission or distribution thereof and includes transformers converters, switch-gears, capacitors, synchronous condensers, structures, cable and other appurtenant equipment and any buildings used for that purpose and the site thereof.[23]
132. **Encroachment:** means an act to enter into the possession or rights either of permanent or temporary nature on a land or built up property of local body or state or Central Government or any public entity. [4]
133. **Environment:** includes water, air and land and the inter-relationship which exists among and between water, air and land, and human beings, other living creatures, plants, micro-Organism and property. [24]
134. **Equivalent Car Space (ECS):** A unit used to specify parking space requirements where one equivalent car space is equivalent to one standard car and the other modes are converted into this unit depending upon their size and parking space requirements, accordingly the ECS of a two-wheeler, bicycle, and a truck is 0.25, 0.10, and 3.00 respectively. [2]
135. **EWS:** EWS households are defined as households having an annual income up to Rs . 3,00,000 (Rupees Three Lakh). [77]
136. **EWS House:** An all-wealher single unit or a unit in a multi-storied super structure having carpet area of up to 30 sq.m. with adequate basic civic services and infrastructure services like toilet, water, electricity etc. [77]
137. **Existing Land Use Plan:** The Plan showing the different land use existing at the time of preparation of the Existing Land Use Plan of Planning Area. [7]

F

138. **Facility:** A premises where health care, educational, socio-cultural, and recreational activities take place. [2]
139. **Fault Line:** is a line on a rock surface or the ground that traces a geological fault.
140. **Fair Grounds:** A multipurpose, centrally located, facility for a variety of short-duration socio-cultural, economic, and political functions. [2]
141. **Farm House:** A farm, located in the green belt around a city, used generally for agriculture and allied activities, where a dwelling unit of a specified size (e.g. 100 to 150 sq. m.) is also permitted. [11]
- OR**
- Farm House:** means a building allowed on a minimum holding of 2.5 acre of agricultural land for residential activity of the land holder. [7]
142. **Feature Class:** In GIS, a classification describing the format of geographic features, such as point, arc, node, route-system, route, section, polygon and region, and the supporting data in a coverage. [11]
143. **Fencing:** Plant or construction materials used for provision of fences around an area. [4]
144. **Fire Station:** A premise having facility for firefighting for a catchment area assigned to it. It may include residence of essential staff. [2]
145. **Flat / Apartment / Residential Flat:** A complete dwelling unit, with independent entrance, for one household within a group housing complex containing similar such units. [4]
146. **Flood Control:** Measures taken to prevent the damage to human life and property due to floods and include dredging, maintaining vegetation as ground cover, and construction of dams. [63]
147. **Flood Zone / Flood Area:** Area inundated during floods. [63]
148. **Flora:** The Plant Life of an area [48]

149. **Floor Area Ratio (FAR):** The ratio of the gross floor area on all floors of a building to the area of the plot on which it is located and multiplied by 100, e.g., an FAR of 250 means that the gross floor area on all floors of a building can be 250 per cent of the area of the plot on which it is located. The quotient obtained by dividing the combined covered area (plinth area) of all floors, excepting areas specifically exempted under these regulations, by the total area of the plot. [4]
150. **Footpath / Footway / Path / Pathway Pedestrian Path / Sidewalk / Walkway:** Footpaths are defined as any area primarily used by 'all' pedestrians. They can be adjacent to roadways or away from the road. A footpath should consist of a dead or frontage zone, pedestrian zone and a multi-functional zone (IRC: 1 03). [41]
151. **Forecasting:** The technique of estimating the future conditions related to demographic and socio-economic characteristics, demand and supply of infrastructure, traffic volume etc. [41]
152. **Forest Cover:** The Ministry of Environment, Forest and Climate Change defines 'forest cover' in India as "all lands, more than one hectare in area with a tree canopy density of more than 10%".
153. **Forest:** The 1996 Supreme Court judgement expanded the definition of forest to include lands that were already notified by the Centre as forests, that appear in government as well as those that fell in the "dictionary definition" of forest. This description covers all statutorily recognised forests, whether designated as reserved, protected or otherwise.
154. **Freight Complex:** A complex having premises for booking and storage of goods that a train, truck, ship or aircraft carries. [2]
155. **Freight Transport:** Movement of goods by means of common, carriers. [2]

G

156. **Gap Analysis:** A process of evaluation of the difference between the demand and supply of an activity at a given point of time, or between the current and future state of an activity, with a view to identify the action needed and resources required to bridge the gap, if any. [2]
157. **Garden:** An open space landscaped with trees, plants, flowers, water bodies, and other manmade elements of landscape for outdoor relaxation and pleasure. [64]
158. **Gau Shala/ Dairy Farm:** A premise with facilities for rearing and processing of dairy products. It may have temporary structure for sheds of animals and birds. [2]
159. **Geographic Information System (GIS):** A system which provides computerized mechanisms for integrating various geo information data sets and analysing them in order to generate information relevant to planning needs in a context. [5]
160. **Geomorphology:** is a science that deals with the relief features of the earth or of another celestial body (such as the moon) and seeks an interpretation of them based on their origins and development.
161. **Goals:** Broad and general statements, that highlight the vision and development approach which direct further planning and implementation efforts. [2]
162. **Golf Course:** A tract of land laid out with at least nine holes for playing a game of golf and improved with tees, greens, fairways, and hazards. A golf course includes a clubhouse and shelters as accessory uses. An area or course for playing golf, consisting of at least nine holes, except miniature golf, within which the playing area is not artificially illuminated. At least nine separate holes consisting of a separate tee, fairway, and green for each of the nine holes, and requiring the use of standard golf clubs in addition to a putter. The minimum length of a golf course shall be 2,000 yards total, measuring from the front of each tee to the middle of each green. [4]
163. **Government:** The system that has authority to govern a country and comprises three arms: the legislature to make laws, the administration-responsible for implementation of the laws, and the judiciary to protect the laws and ensure justice. [31]
164. **Government Housing Scheme:** A project, often funded by a local or state or central government or jointly or another organization that provides homes for people to buy or rent at a low price. For e.g., Pradhan Mantri Awas Yojana.
165. **Government Quarter:** housing provided to an employer by the government. [5]
166. **Govt.; Semi Govt.; Public Undertaking; Local Body Office:** A premise used for offices of the Union and State Governments, semi-Government organizations, Public Sector Undertakings and Local Body Offices. [6]

167. **Gradient:** The degree of slope of land, pipe invert or road as compared with horizontal.[62]
168. **Grave Yard:** a place where dead people are buried.[2]
169. **Greell Belt:** An area of land predominantly agricultme in use, located around the proposed urbanisable limit of an urban area with a view to controlling its growth, preserving towns from merging into one another or to preserve special neighbouring character of a town. [64]
170. **Grid:** In GIS, a geographic data model representing information as an array of equally sized square cells, referenced by their respective geogrnphic x, y locations, and arranged in rows and columns. [5]
171. **Gross Domestic Product:** represents the total monetary value of all final goods and services produced (and sold on the market) within a country during a period of time (typically 1 year).
172. **Ground Control Points:** Reference points on ground, obtained, through ground survey, to control and correct distortion of remote sensing images. [5]
173. **Ground Cover:** Planting material that forms a carpet of low height. [4]
174. **Ground Level Reservoir:** Ground reservoir includes four parts: storage zone consisting with natural storage structure, dam to enclose storage zone, infiltration works of surface water and water-intake, works from groundwater. In many countries, ground reservoirs always are referred to ASR (Aquifer Storage & Recovery). [62]
175. **Ground water:** The water under the earth's surface in an aquifer or in the soil, water of a spring or a shallow well. [62]
176. **Group Housing:** means a building unit constructed or to be constructed with one or more floors having more than two dwelling units having common service facilities where land is owned jointly (as in the case of co-operative societies or the public agencies, such as local authorities or housing boards, etc.) and the construction is undertaken by one Agency. [4]
177. **Growth:** A process of positive change or Quantitative increase or expansion in size. [20]
178. **Growth Rate:** Statistical estimate of the percentage increase or decrease in size of an entity or population of area(s) in a given year. [20]
179. **Guard House:** A building built in compliance with all building codes of the [jurisdiction] and all the terms granted in a special use permit and located on a private road or on private property adjacent to a private road as shown on the site plan approved with the special use permit, for the purpose of manually or electronically regulating and monitoring pedestrian and/or vehicular traffic into a subdivision or neighbourhood and promoting security within the subdivision or neighbourhood; provided, however, a guardhouse shall not be designed or used for sleeping or living purposes. [76]
180. **Guest House:** It means tourist houses having 5 to 20 rooms along with dormitory, dining hall, and capacity to provide kitchen. In the guest house any kind of banquet hall, seminal hall, wedding point or other multi-purpose hall for any community activities shall not be permitted. [3]
181. **Gymnasium/ Health Club:** A facility where members or non-members use equipment or space for the purpose of physical exercise. [4]

H

182. **Hamlet:** A physically identifiable part of a dispersed village comprising a few households.[6]
183. **Hazardous Building:** Any building or part thereof, which is used for the storage, handling, manufacture or processing of highly combustible or explosive materials or products which are liable to burn with extreme rapidity and/ or which may produce poisonous fumes or explosions for storage, handling, manufacturing or processing which involve highly corrosive, toxic or noxious alkalis, acid or other liquids or chemicals producing flame, fumes, and explosive, mixtures of dust or which result in the division of matter into fine particles subject to spontaneous ignition. [4] [3]
184. **Health Care Facilities:** The premises where health care services are located e.g., hospitals, clinics, nursing homes, pharmacies, and training centres for health workers. [2]
185. **Health Centre/ Family Welfare Centre:** A premise having facilities for treatment of indoor and outdoor patients having up to 30 beds. It may be managed by a public or a charitable institution on non-commercial basis. [2]
186. **Heritage Zone:** Means those areas of archaeological or historical or architectural or aesthetic or scientific or environmental or cultural significance including man made and

- natural features and sites of scenic beauty which are included in a list(s) published by notification in the Government Gazette, by the Government, from time to time. [26]
187. **Historic Site:** An area having historical, architectural, archaeological, or cultural value that is protected by Survey of India or needs to be protected by the local community or state government. [65]
 188. **Horticulture:** Horticulture is the art of cultivating plants in gardens to produce food and medicinal ingredients, or for comfort and ornamental purposes. Horticulturists are agriculturists who grow flowers, fruits and nuts, vegetables and herbs, as well as ornamental trees and lawns. [66]
 189. **Hospital:** A building complex, having more than 30 beds with all necessary facilities, and services, providing general or specialised health-care facilities including observations, care, treatment to indoor patients and medical advice to outdoor patients suffering from illness, disease or injury and managed by public body or private institution. [4]
 190. **Hostel:** A building having several rooms with independent access and attached or common toilet/bath as well as other facilities like dining and indoor recreational spaces for letting out on long term basis to students or other persons belonging to an institution or otherwise. [4]
 191. **Hotel:** A building having a capacity of more than 20 rooms along with independent access and attached or common toilet/bath with or without dining and other facilities, with fooding facilities and multi-purpose hall for conference, exhibition for public programs. [3]
 192. **Household:** is a small group of persons who share the same living accommodation, who pool some, or all, of their income and wealth and who consume certain types of goods and services collectively, mainly housing and food. [20]
 193. **Housing:** The total physical environment within and outside the house where families and households live and includes houses, and all necessary utilities, community facilities, park, playground, and roads. In Low-Income Group (LIG) housing accommodating households engaged in same or similar occupation, a common place of work is also included as an integral part of housing. [57]
 194. **Housing Dwelling:** A single self-contained house with independent access designed and constructed as an independent unit of a residential area.
 195. **Household Industry:** A small-scale industry, operated from a house by one or more members of the household for production or for servicing and repairs of goods. [11]
- OR**
- Household Industry:** means household occupation/industry conducted only by family members/persons residing in the dwelling with or without power and not contrary to the provisions of the Water Pollution (Prevention and Control) Act 1974, Air Pollution (Prevention and Control) Act, 1981, and Environment (Protection) Act, 1986. [7]
196. **Housing Conditions:** General state of housing stock as measured by its age, quality, state of repairs and value. [20]
 197. **Housing Policy:** A series of financial, laJld-related, and administmtive measures undertaken by the government to bridge the gap between the supply and demand of housing stock, ensure access to shelter to all sections of the society especially the economically weaker sections. [57]
 198. **Housing Shortage:** The gap between the demand and supply of dwelling units of various types for different sections of the society. [57]
 199. **Housing Stock:** The total quantity of housing units, irrespective of condition, legal status, or compliance of norms and standards, existing in a housing market at a given point of time. [57]
 200. **Hydrology:** is a science dealing with the properties, distribution, and circulation of water on and below the earth's surface and in the atmosphere.
 201. **Human Settlement:**
- I**
202. **Image:**
 203. **Implementation:** The process of execution or carrying out of the provisions of a policy, plan, programme, project or scheme. [2]
 204. **Individual House:** A premise for one dwelling unit which may or may not have on it one main building block and one accessory block for garage/ garages and servant quarters. [4]

205. **Indore stadium:** A premise for indoor stadium with play area and spectator seating including related facilities. [4]
206. **Industrial Land Use:** The use of a parcel of land, where process of manufacturing and related activities are being carried out (existing industrial land use) or will be permitted in future (proposed industrial land use). [2]
207. **Industrial Sector:** The sector of economy contributing to development and employment generation comprising manufacturing of products, machines and consumer goods. [2]
208. **Industry:** A group of productive enterprises or organizations that produce or supply goods, services, or sources of income. In economics, industries are generally classified as primary, secondary, tertiary, and quaternary; secondary industries are further classified as heavy and light. Industry" means a specific branch of manufacture and trade, which includes green, orange and red category industries as categorized by Uttarakhand Pollution Control Board Department of Industries or as amended from time to time. It excludes mining and quarrying. [7]
209. **Informal Sector Economy:** The sector of economy where the labour force is self-employed with family support, in economic activities such as trading and street vending that do not have any formal structure and designated areas, and is characterised by small-scale, labour-intensive operation. [67]
210. **Infrastructure:** The basic components of a human settlement that make it functional, improve its quality of life and include - network of water supply, sewerage, drainage, electricity, communication, transportation and facilities and services. [62]
211. **Institution:** A society or organisation established, through law, or otherwise, for a specific purpose. [4]
212. **Integrated Freight Complex:** A strategically located premises, with access from both railway and a highway, comprising wholesale market, warehousing, truck terminal, railway station and other related uses and infrastructure with a view to facilitate integrated movement of goods by rail as well as road. [41]

J

213. **Jail:** "Prison" means any jailor place used permanently or temporarily under the general or special orders of a State Government for the detention of prisoners, and includes all lands and buildings appurtenant thereto, but does not include- (a) any place for the confinement of prisoners who are exclusively in the custody of the police; (b) any place specially appointed by the State Government under section 541 of the Code of Criminal Procedure, 1882 (10 of 1882); or (c) any place which has been declared by the State Government, by general or special order, to be a subsidiary jail. [68]
214. **Junction:** A place, serving as an interchange point, where two or more roads or railway lines meet. [69]
215. **Jurisdiction:** The area, defined by a clear boundary (such as the municipal area, district, or state) within which the authority and powers of a legally constituted body extends and ceases beyond it. [2]

K

216. **Khasra Number:** Official map of a village record indicating boundaries of all properties, dimensions, property number, ownership and other details. The property number, as recorded on the official khasra map used in land acquisition notification to identify the property and its other details. [21]
217. **Kitchen:** A place used for cooking of food [20]

L

218. **Labour Force Participation Rate:** is calculated as the labour force divided by the total working-age population. The working age population refers to people aged 15 to 64. This indicator is broken down by age group and it is measured as a percentage of each age group.
219. **Lake:** A large body of water within land and can be natural or man made. [38]

220. **Land Administration:** is the way in which the rules of land tenure are applied and made operational. A good land administration system aims at equitable distribution of wealth to encourage economic growth and development.
221. **Land Development:** 'development' with its grammatical variations, means the carrying out of building, engineering, mining or other operations in, on, over or under land, or the making of any material change in any building or land, and includes re-development. [1]
222. **Land Disposal:** The procedure of sale or lease of land, acquired by a planning and development authority or local body for public purposes, according to the miles made in this respect. [29]
223. **Land Use-** (a) The manner in which land is used at a given point of time to accommodate various human needs, (b) The activity that can be legally performed on a parcel of land and includes, in the context of urban settlements, residential, commercial, manufacturing, public and semi-public, recreation including open spaces, transport and communication, agriculture and other special areas, which are further subdivided into sub-categories. [2]
224. **Land Use Plan (Existing):** A plan that gives the existing (in a given year) land use of parcels of land in the planning area of a settlement and is supported by quantitative and qualitative analysis of each land use. [2]
225. **Land Use Plan (Proposed):** A plan that gives the proposed land use of the area of a settlement that is likely to be developed during the plan period (5 years, or 20-25 years as the case may be) for various purposes and activities having regard to socio economic development needs as well as physical, environmental and accessibility considerations. Such plans serve as a guide to planned development of the settlement, land acquisition for public purposes, and future capital budgeting. [2]
226. **Land:** the expression "land" includes benefits to arise out of land, and things attached to the earth or permanently fastened to anything attached to the earth. [29]
227. **Land Value:** is a worth of a piece of property, which includes both the value of the land itself and any enhancements made to it. [29]
228. **Landfill:** A designated disposal facility or part thereof, generally located on the outskirts of a city or away from residential zone, where municipal wastes are placed in or on land. [62]
229. **Landmark:** A distinctive building or feature which can be entered or passed through and which stands out as being easily identifiable and easily retained image, forming part of the mental picture of a city. [71]
230. **Lane:** A portion of a road surface, usually indicated by road markings, that is intended for movement of one row of vehicles. [41]
231. **Large Industries:** Industries that have fixed assets without depreciation, or project cost of more than Rs. 5 crores. [46]
232. **Law:**
233. **Layout Plan/ Site Plan/ Site Layout:** A plan of an area showing its sub-divisions, land use, infrastructure services, prepared within the framework of the Master Plan, and/or zoning and sub-division regulations. Layout Plan means a Plan indicating configuration and sizes of all Use Premises. Each Use Zone may have one or more than one Layout Plan depending upon the extensiveness of the area under the specific Use Zones and vice versa. A layout plan shall have at least two use premises (apart from Recreational, utilities and transportation) and a minimum area of 1 hectare. [4]
234. **Lease:** A contractual agreement between a tenant and a landlord whereby the landlord permits a tenant to use his property for a specified period and use on payment of a specified rent and compliance of other mutually agreed conditions. [29]
235. **Level of Service (LOS):** A measure that represents quality of service, measured on an A to F scale, with LOS-A representing the best operating conditions from the traveller's perspective and LOS-F the worst. [39]
236. **Level of Urbanisation - Degree of Urbanisation:** The percentage of urban population to the total population in a country, state or region. [20]
237. **Library/ Reading Room:** A premise having a large collection of books for reading and reference for general public or specific class. [2]
238. **Literacy Rate:** The percentage of literates in the age group of seven years and above. [20]
239. **Literate:** A person aged 7 years and above who can both read and write with understanding in any language was taken as literate. [20]

240. **Local Bus Service:** An intra-city bus service that usually links residential areas and major activity centres using the local street system. [72]
241. **Local Road! / Local Street:** A street primarily for access to residence, business or other abutting property. Its primary function shall be for local activities and access to properties and not through movement of traffic. Local streets may not have a dedicated footpath and can be designed as shared space that gives priority to NMT modes. Various traffic calming elements will be employed to ensure that vehicle speeds are below 20 kmph, safe for intermingling of pedestrians, cyclists and motor vehicles. [41]
242. **Location Map:** A map showing the location of the project site in relation to neighbouring areas, settlements, transportation routes and other prominent features with a view to provide a clear comprehension of the locational characteristics of the site. [71]
243. **LPG Go down:** A premise where cylinders of LPG are stored. [73]

M

244. **Main Himalayan Thrust:** The Indian plate on the western side has a 'divergent' boundary with the African plate named Central Indian Ridge (CIR), and a 'transform' boundary with the Arabian plate called the Owen Fracture Zone (OFZ). On the northern side, the Indian plate converges with the Eurasian Plate and forms the Himalayas.
245. **Main Worker:** Workers who worked for more than 6 months (180 days) in the reference period are termed as Main workers. [20]
246. **Mall:** A large retail commercial complex with one large establishment acting as the anchor and several other small shops, owned and managed by different persons, selling a variety of goods and services. [4]
247. **Mandi Town:** A town where trading of agricultural produce is the main economic activity and forms its economic base. [2]
248. **Manufacturing Industries:** Industries that produce goods by using or processing a variety of raw, semi-processed and / or recycled materials. [46]
249. **Map:** A representation on paper, of physical features, size, location, use, political and administrative boundaries, and other characteristics on land drawn to scale using cartographic techniques as per requirements. [71]
250. **Marginal Workers:** Workers who worked for less than six months (180 days) in the reference period are termed as Marginal Workers. [20]
251. **Market:** Market includes any place where persons assemble for the sale of, or for the purpose of exposing for sale, live-stock or food for live-stock or meat, fish fruit, vegetables, animals intended for human food or any other articles of human food whatsoever with or without the consent of the owner of such place, notwithstanding that there may be no common regulation of the concourse of buyers and sellers and whether or not any control is exercised over the business of or the persons frequenting the market by the owner of the place or any other person. [42]
252. **Master Plan/ Development Plan:** Master Plan/ Development plan is a statutory plan prepared (under relevant Act) within the framework of an approved perspective plan. The objective of a development plan is to provide further necessary details and intended actions in the form of strategies and physical proposals for various policies given in the perspective plan and regional plan depending upon the economic and social needs and aspiration of the people, available resources and priorities. [2]
253. **Median / Divider:** An area in the approximate center of a city street or state highway that is used to separate the directional flow of traffic, is demarcated by curb and guttering, having painted or thermally applied stripes or other means of distinguishing it from the portion of the roadway used for through traffic. [41]
254. **Medium Industries:** Where the investment in plant and machinery is more than five crore rupees but does not exceed ten crore rupees. [30]
255. **Metropolis:** (a) Demographically, a city having a population of one million and above, (b) Administratively, a city having a population of one million and above and governed by one or more municipal body (ies), (c) Functionally, a city having a population of one million and above serving its influence region as the dominating centre of trade, commerce, art, culture, health care, recreation, education, research, adtnistration and political activity. [20]

256. **Macro climate:** The climate of a localised area which may differ from the overall climate of the wider area due to local factors such as tree cover (or the absence of tree cover), or exposure to winds. [74]
257. **Migrant:** A person who moves from one place to another. [20]
258. **Migration Population Drift:** Movement of people from one place to another generally for employment, or other social purposes like education or marriage. [20]
259. **Mining:** All or any pan of the process involved in the mining of minerals by removing overburden and mining directly from the mineral deposits, open pit mining or minerals naturally exposed, mining by auger method, dredging and quarrying, underground mining, and surface work incidental to an underground mine. [28]
260. **Mining Site:** The entire area including land and water, encompassed in the mining site plan. [28]
261. **Mixed Land Use:** The phenomenon of existence of two or more uses on a site, or plot or in a building, which mayor may not be compatible. [2]
262. **Mixed Use:** Mixed-use is a kind of urban development, urban design, urban planning and/or a zoning type that blends multiple uses, such as residential, commercial, cultural, institutional, or entertainment, into one space, where those functions are to some degree physically and functionally integrated and that provides pedestrian connections. Mixed development may be applied to a single building, a block or neighbourhood or zoning policy across an entire city or other administrative unit. [2]
263. **Mosaic:** An assemblage of overlapping aerial or satellite photographs or images whose edges have been matched to form a continuous pictorial representation of a portion of the earth's surface. [5]
264. **Mosque:** A building or a complex of building with related infrastructure including parking and serving as an Islamic place of worship. [52]
265. **Multiplex:** It shall mean an integrated entertainment and shopping complex/center. It shall necessarily have minimum two cinema halls and may have Theatres, Auditorium, Retail Shops, Commercial show rooms, Restaurants and Food plazas, Health club and Fitness center, Clubs, Call centers, Corporate Offices, Convention Hall, Bank, Cyber cafe, Video Games, Parlours, Pubs, Bowling Allies and Recreational activities and all the areas building except cinema halls shall fall in the commercial category. [3]
266. **Multi-storey parking:** A building designed for car and motorcycle parking and where there are a number of floors or levels on which parking takes place. [4]
267. **Municipal Area:** The territorial area under the jurisdiction of municipality as notified by the Governor. [11]
268. **Municipal Corporation I Nagar Nigam:** "Corporation" or "Municipal Corporation" means the Municipal Corporation constituted for a city under sub-clause (c) of clause (1) of Article 243-Q of the constitution. [42]
269. **Municipal Council/ Nagar Palika/ Nagar Parishad:** An elected urban local body of self-governance for smaller urban areas constituted under the Municipal act. [6]
270. **Municipal Government:** A municipal council, or corporation or Nagar Panchayat, constituted by election as per relevant municipal act to make policies, collect taxes, and discharge the specified administrative and developmental functions within their respective area of jurisdiction. [6]
271. **Municipal Solid Waste:** All types of solid waste, except hospital waste, generated by different residential and commercial areas located in a municipality. [62]
272. **Municipality:** The urban local institution of self-governance constituted under Municipal act [6]
273. **Museum:** A building having public significance by reason of its architecture or former use or occupancy or a building serving as a deposit for a collection of natural, scientific, or literary curiosities or objects of interest, or works of art, and arranged, intended, and designed to be used by members of the public for viewing, with or without an admission charge, and which may include as an accessory use the sale of goods to the public as gifts or for their own use. [4]

N

274. **Nallah:** In Hindi, an open main drain carrying storm water and/or sewage in a settlement. [21]
275. **Natural Growth:** The surplus of population due to excess of births over deaths and does not include increase due to migration. [20]
276. **Natural Reserve Area:** (a) A designated area of ecological significance with diversified flora and fauna kept reserved in their natural state for conservation, study, research and human enjoyment, (b) Designated areas, generally kept reserved in their natural state, that are unsuitable for urban development due to natural constraints and include rivers and their 100-year floodplains, wetlands, steep hill slopes etc. [61]
277. **Nazul Land:** In Persian, the land vested with the government. [21]
278. **Neighborhood:** A residential planning unit in a city comprising housing-clusters that can support all necessary facilities and services to serve a population of 3,000 to 6,000 persons. [2]
279. **Net Residential Density:** The number of persons per unit area (hectare or acre) of a residential site and it excludes area devoted to sector level facilities, services, commercial activity, parks, open spaces, and major roads (net residential density is generally double of the gross residential density as about 50 per cent area is occupied by sector level uses). [2]
280. **Network:** (a) In transportation, a system that comprises transportation by rail, road, air, waterways, wires and pipe lines, (b) In planning, a system of transport and utility lines including water supply, electricity, gas, communication, roads connecting different areas of a city, (c) In administration, a system of relationship between different institutions, organisations and agencies having similar interests of organisational goals. [2]
281. **New Town:** A self-contained town having its own economic base, administration and governance, comprehensively planned on a virgin site for accommodating industrial, commercial, and residential activities that are served by necessary utilities, facilities and services. [2]
282. **Night Shelter/ Ran Basera:** A premises generally owned and managed by the urban local body agency, for providing accommodation, in the night only, to homeless urban poor on daily payment of a token amount as rent, or without any charge. [2]
283. **Noise Pollution:** An undesirable sound produced by any source that has adverse impact on human beings such as annoyance, irritation, and deafness. [75]
284. **Non-Motorised Transport:** is active and human-powered transport includes walking, cycling, and variants such as wheelchair travel, skating and handcarts.
285. **Notified Area:** If in the opinion of the State Government any-area within the State requires to be developed according to plan it may, by notification in the Gazette declare the area to be a development area. [1]
286. **Nursery:** Any land used to raise trees, shrubs, flowers, and other plants for sale or for transplanting. [66]
287. **Nursing Home / maternity Home / Polyclinic:** A premise having medical facilities for indoor and outdoor patients having up to 50 beds, where persons suffering from illness, injury or infirmity are usually received or accommodated or both the purposes of observation, Nursing and treatment. In case of polyclinic, it shall be managed by a group of doctors. [2]

O

288. **Occupancy / Use:-** Number of persons per habitable room in a house. The principal occupancy/ use for which a building or a part of a building is intended to be used. For the purposes of classification of a building according to occupancy, an occupancy shall be deemed to include the subsidiary occupancies which are contingent upon it [4]. "Mixed occupancy" buildings being those in which more than one occupancy is present in different portions of the buildings [4].
289. **Office:** A building used for performing the functions and activities related to a government ministry or department, corporate body, private company or an individual. [4]
290. **Off-Street Parking Area:** A site or a portion of a site devoted to the off-street parking of vehicles, including parking spaces, aisles, access drives, and landscaped areas, and providing vehicular access to a public street. (Santa Rosa, Calif.). A land surface or facility providing vehicular parking spaces off of a street together with drives and manoeuvring lanes so as to provide access for entrance and exit for the parking of motor vehicles. [2]

291. **Old Age Home/ Care Centre for physically/ mentally Challenged:** A premise with commercial or non-commercial arrangement for long or short term stays of old people/ senior citizens. It may include arrangement for recreation, general health, catering etc [11]. A premise having the facility of caring and training boarding and lodging of the elderly/ physically/ mentally challenged. [2]
292. **On-Street Parking:** The storage space for an automobile that is located within the street right-of-way. [2]
293. **Open Space:** "Open space" means any land (whether enclosed or not), belonging to the State Government or any local authority, on which there are no buildings or of which not more than one-twentieth part is covered with buildings, and whole or the remainder of which is used for purposes or recreation, air or light. [79]
294. **Orchard:** An enclosure for growing fruit trees for commercial purposes. [55]
295. **Origin:** The starting point or zone of a trip. [41]
296. **Orphanage:** A building with facilities for boarding and lodging of children, who are bereaved of parents. It may or may not have educational facilities. [2]
297. **Overall Density:**
298. **Overcrowding:** Excessive concentration of activities and people in an area that cannot be supported the existing infrastructure. [11]
299. **Overhead tank (OHT):** A premise having overhead tank for storage and supply of water to its neighbouring areas. It may or may not include a pump house. [62]

P

300. **Panchayat:** "Panchayat" means an institution of self-government constituted under article 243B of Constitution of India for the rural areas. [6]
301. **Park:** An appropriately landscaped place used for outdoor leisure activity and may have fencing, parking space and public toilet. A premise used for recreational leisure activities. It may have on it related landscaping, parking facilities, public toilet, fencing etc . It will include synonyms like lawn, open space, green etc. [79]
302. **Parking Space/ Area:** Any public or private land area designed and used for parking motor vehicles including parking lots, garages, private driveways, and legally designated areas of public streets (Bondurallf, Iowa). Parking space is an enclosed or unenclosed covered or open area sufficient in size to park vehicles. Parking spaces shall be served by a driveway connecting them with a street or alley and permitting ingress and egress of vehicles [4].
303. **Passenger Car Unit (PCU):** An adjustment factor to convert a heterogeneous traffic into a homogeneous traffic where each vehicle type is assigned a factor equivalent to a passenger car to convert it to the passenger car unit (PCU) (e.g. for car - 1-PCU, for Truck- 3-PCU). [41]
304. **Path:** (a) In transport, see footpath, (b) In urban design, channel of movement in a city along which people walk, observe the various buildings and features and form part of the perceived image of the city. [41]
305. **Peak Hour:** The hour, generally, in the morning and evening, when there is a maximum flow of traffic on a given transportation facility or corridor. [41]
306. **Permission or Permit:** A valid permission or authorization in writing by the competent authority to carryout development or a work regulated by the regulations/ bye-laws of the competent authority. [4]
307. **Permitted Activities/ Buildings:** Use as specified in the zoning regulations/ master plan that are unconditionally allowed within specific land use. [2]
308. **Permitted Activities/ Buildings with Condition:** Use as specified in the zoning regulations/ master plan that require certain conditions within specific land use. Conditions are specified in the concerned zoning regulation/ master plan document.
309. **Petrol Pump/Service Station:** Means any premises specially prepared for the fuelling of motor vehicles and includes such places within the premises which have been specially approved by the licensing authority for the servicing of motor vehicles and for other purposes. [32]
310. **Pharmaceutical Industry:** An industry discovers, develops, produces, and markets drugs or pharmaceutical drugs for use as medications to be administered to patients, with the aim to cure them, vaccinate them, or alleviate symptoms. [46]

311. **Physical Infrastructure:** Essential utilities and services like water supply, sewerage, drainage, power supply and solid waste management. [2]
312. **Physical Planning/ City Planning/ Land Use Planning/ Spatial Planning/ Town Planning:** A process of formulation of the plan of a settlement or region, as the case may be, which serves as a tool in guiding the manner in which land will be used for various socio economic and physical activities and infrastructure provision and development therein shall be carried out by the public or private agencies. [2]
313. **Plan:** (a) In spatial planning, a two dimensional representation of (i) existing or proposed characteristics of land and arrangement of various land uses and transportation network in an area, or (ii) spatial variations of an attribute, or (iii) distribution of various policy zones in a city or region, (b) In economic planning, a document highlighting the characteristics of different sectors of economy, and proposed policies, programmes along with fiscal allocations for economic development and social justice in an area, (c) In administration, a scheme for accomplishing organisational goals, (d) In design, an arrangement of different components of a building at plinth level, seen from above. [2]
314. **Planning Area:** An area, declared under the relevant act, having well defined boundaries identified by natural or manmade elements, for which the master plan or development plan shall be prepared. [1]
315. **Planning Authority:** Hereby means Department of Town and Country Planning, Government of Uttarakhand. [1]
316. **Planning:** A continuous, time-oriented and cyclic process of identification and achievement of goals. [2]
317. **Play Ground:** "Playground" means a piece of land adapted for the purpose of play, game or sport and used by any educational institution or club or other association. [79]
318. **Plot/ Lot/ Site:** A single unit of subdivision of land, that can be identified and defined in a layout plan, intended for the indicated specific use. A piece of land enclosed by definite boundaries. The maximum average between the frontage and depth of a plot meant for whatsoever purpose should be 1: 3.5 after leaving required right of way. In case of the average being higher than stated above, the map shall be approved only on notional 1:3.5 average of the plot and the remaining space shall remain open [11] [3]. Plot/ Site is a parcel or piece of land enclosed by definite boundaries. [4]
319. **Plotted Housing (Residential Plot):** A Premise for one or more than one dwelling unit and may have on it one main building block and one accessory block for garages and service personnel. [9]
320. **Police Post:** A Building accommodating office and residential accommodation of some essential staff of police serving a designated local area having a population of about 50,000 (this figure may change). [47]
321. **Police Station:** A building accommodating office and residential accommodation of some essential staff of police serving a designated area and having a population of 75,000 to 100,000 (this figure may change). [47]
322. **Pollution Control:** Precautionary legal, administrative, planning and monitoring procedures to control various sources of environmental contamination that are capable of causing harm to man or any other living organism supported by environment. [75]
323. **Pollution:** Release of any environmental medium-air, water or land from any process or substances which are capable of causing harm to man or any other living organism supported by the environment. [75]
324. **Population Density:** Number of persons per unit area (i.e. acre, hectare, square mile, square kilometre etc.). [2]
325. **Population Projection / Population Forecast:** The statistical methods of calculation of population size of an area or settlement at a given point of time in future. [20]
326. **Post Office:** A building used for collection, sorting, and distribution of articles sent by post to people as well as providing services related to deposit of money as a bank, and money-transfer from one place to another. A premise with facility for postal communication for public use. [2]
327. **Potable Water:** Water that is satisfactory for drinking, culinary, and domestic purposes, meeting current drinking water standards. Water which is satisfactory for drinking and

- culinary purposes. The use of water for direct human consumption, human contact, or in the preparation of foods for human consumption. [62]
328. **Poultry Farm:** A premise with facilities for poultry products. It may have temporary structures for sheds of birds. [2]
329. **Poverty:** (a) Poverty can be defined as a condition in which an individual or household lacks the financial resources to afford a basic minimum standard of living. (b) A condition where the people live on earnings less than US \$2 per capita per day. [32]
330. **Power Plant:** A power plant is an industrial facility that generates electricity from primary energy. Most power plants use one or more generators that convert mechanical energy into electrical energy in order to supply power to the electrical grid for society's electrical needs. [44]
331. **Primary Health Centre/ Family Welfare Centre/ Diagnostic Centre:** A premise having facilities for treating indoor and outdoor patients having up to 10-15 beds. It may be managed by a public or charitable institution on non-commercial basis. It includes family welfare centre and maternity home. [2]
332. **Primary School:** An institution located in a building or a campus of several buildings, managed by public or private institution, for offering education and play facilities for children between 6 to 10 years' age studying in I to V class/ standard. [2]
333. **Primary Sector:** includes all those activities for exploiting natural resources: agriculture, fishing, forestry, mining, and deposits.
334. **Printing Press/ Printing Plant (Service industry):** A commercial printing operation involving a process that is considered printing, imprinting, reproducing, or duplicating images and using printing methods including but not limited to offset printing, lithography, web offset, flexographic, and screen process printing. [46]
335. **Private Garage:** A building or outhouse designed or used for the storage of private owned motor vehicles.
336. **Private Office:** A building used for performing the functions and activities related to private company or an individual. [54]
337. **Project:** A document related to a building, site, or equipment with all necessary supporting legal, administrative and technical details, estimated cost, sources of finance and cost recovery for submission to a funding agency or an approving body. [62]
338. **Proposed Land Use Plan:** It means the plan showing the proposed admissible uses of different areas and land use zones covered in the Planning Area. [7]
339. **Protected Area:** An area, building or structure designated as such, by law or otherwise in an approved plan, for protection from its misuse or abuse because of its special characteristics or historical or architectural significance or natural beauty. [61]
340. **Public and Semi-Public Activities/ Building:** A building used or intended to be used either ordinarily or occasionally by the public such as offices of State or Central Government, Public sector undertakings or Local authorities, a church, temple, chapel, mosque or any place of public worship, dharmashala/ashram, college, school, library, theatre for cultural activities, public concert room, public hall, hospital run by public institutions, public exhibition hall, lecture room or any other place of public assembly. Such buildings shall ordinarily include Assembly building, Educational building, Health building, Institutional building. [7] [3]
341. **Public/ Public community Toilets/ Community Latrines:** a building providing WCs, urinals and wash basins for public use with or without payment of charges. [62]
342. **Public Land:** A parcel of land owned by the government (central, state, or municipal) that holds its title and control. [11]
343. **Public Parking:** A parking facility for use of any member of public free of charge or on payment of parking fee. [41]
344. **Public Purpose:** The expression "public purpose" includes- (i) the provision of village sites, or the extension, planned development or improvement of existing village-sites; (ii) the provision of land for town or rural planning; (iii) the provision of land for planned development of land from public funds in pursuance of any scheme or policy of Government and subsequent disposal thereof in whole or in part by lease, assignment or outright sale with the object of securing further development as planned; (iv) the provision of land for a corporation owned or controlled by the State; (v) the provision of land for residential purposes to the poor or landless or to persons residing in areas affected by natural calamities, or to

persons displaced or affected by reason of the implementation of any scheme undertaken by Government, any local authority or a corporation owned or controlled by the State; (vi) the provision of land for carrying out any educational, housing, health or slum clearance scheme sponsored by Government or by any authority established by Government for carrying out any such scheme, or with the prior approval of the appropriate Government, by a local authority, or a society registered under the Societies Registration Act, 1860 (21 of 1860), or under any corresponding law for the time being in force in a state, or a co-operative society within the meaning of any law relating to co-operative societies for the time being in force in any State; (vii) the provision of land for any other scheme of development sponsored by Government or with the prior approval of the appropriate Government, by a local authority; (viii) the provision of any premises or building for locating a public office, but does not include acquisition and for companies. [29]

345. **Public Service:** (a) The civil service, (b) Services provided for the benefit of the people by the national, state or local government and include supply of water, gas, electricity, education and health care. [62]
346. **Public-private Partnership:** Public Private Partnership means an arrangement between a government/ statutory entity/ government owned entity on one side and a private sector entity on the other, for the provision of public assets and/or public services, through investments being made and/or management being undertaken by the private sector entity, for a specified period of time, where there is well defined allocation of risk between the private sector and the public entity and the private entity receives performance linked payments that conform (or are benchmarked) to specified and predetermined performance standards, measurable by the public entity or its representative. [33]

R

347. **Real Estate/ Real Property/ Landed Property:** Includes land, buildings, rights of ways, lights or any other benefit arising out of land and things attached to the earth or permanently fastened to anything which is attached to the earth, but not standing timber, standing crops or grass. [35]
348. **Recreational Area/ Recreational Zone:** An area designated for activities related to active and/ or passive recreation owned by a public agency or private body/ individual. [54]
349. **Recreational Club:** A premise having the facility for recreation with indoor sports, swimming pool, outdoor sports, socializing and gathering space for small functions with restaurant. [2]
350. **Recreational:** An Area designated for activities related to active and passive recreation owned by a public agency or private body. [54]
351. **Redevelopment:** In an Urban renewal programme of a dilapidated area declared unfit for human habitation, a process of (i) temporary or permanent relocation of affected people on the same or to another site, (ii) demolition of buildings, (iii) re-planning the area so cleared having regard to its full potential, (iv) construction of dwellings/other buildings and provision of infrastructure, (v) on completion, allotment of the dwellings to affected people, if located on a temporary site, and (vi) sale of remaining built spaces. [57]
352. **Refuse:** Anything that is discarded as worthless or useless and includes municipal, industrial, and other wastes. [62]
353. **Region:** An area defined by a set of attributes. In practice, a prefix is added to highlight the attributes on which the region has been defined for example, agriculture region, resource region, dry region, planning region, administrative region. [2]
354. **Regulated Area:** It means any area specified or declared as per Master Plan/ Development Control Regulations in force under relevant act by the State Authority or the Local Development Authority with the prior approval of the State Government. [1]
355. **Regulation:** means a regulation made under relevant act by the State Authority or the Local Development Authority with the prior approval of the State Government. [1]
356. **Rehabilitation:** (a) In housing and urban development, a process of improving the quality of a blighted area by one or more of the following actions: partial rebuilding, repair, remodelling, renovating, conserving, providing educational, health care and recreational facilities, or augmenting utilities and services, (b) In case of large projects requiring displacement of people, a processes of providing, the project-affected-people, housing, job opportunities, training to enable them to take up new jobs and financial and technical assistance. [57]

357. **Rejuvenation:** means acceleration of erosive power of the fluvial process (rivers) caused by a variety of factors.
358. **Religious Building:** A general term for the building dedicated to the service of the god and may be a Temple, Mosque, Church, Gurudwara, Ash ram and synagogue. [52]
359. **Remote Sensing:** Science of acquiring information about the Earth's surface without actually being in contact with it. [2]
- OR**
- Remote Sensing:** The measurement or acquisition of information Remote of some property or an object or phenomenon by a remote recording device. [5]
360. **Repair Shop:** A premise equivalent of a retail shop for carrying out repair of household goods, electronic gadgets, automobiles, cycles etc. Other shops include sweets shop, tailor shop, kiraana store, meat shop, mobile repair shop, dock shop, cloth-iron shop, fish products shop, stationary shop, plumbing shop, carpenter shop, utensil shop etc. [9]
361. **Residential Area:** An area in a settlement where people live and is characterised by residential buildings and related facilities, services and infrastructure. [54]
362. **Residential Buildings:** It includes a building in which sleeping and living accommodation is provided for residential purposes, with cooking facilities and includes one or more family dwellings, apartment houses, flats, and private garages of such buildings. [4]
363. **Residential Land Use:** The land use category in a development or layout plan devoted to residential activity, which may be further subdivided into zones/ clusters by nature. [54]
364. **Residential Zone:** A designated area for residential activity where prohibited land uses shall not be allowed to maintain its safety, and environmental quality. [54]
365. **Resolution:** (a) In GIS and remote sensing, resolution is the accuracy at which a given map scale can depict the location and shape of geographic features where, the larger the map scale, the higher is the possible resolution. [5]
366. **Resort:** A group or groups of buildings containing more than five dwelling units and guest rooms and providing outdoor recreational activities that may include golf, horseback riding, swimming, shuffleboard, tennis and similar activities. A resort may furnish services customarily furnished by a hotel, including a restaurant, cocktail lounge, and convention facilities. [4]
367. **Restaurant:** A premises used for cooking and serving, on commercial basis, food items to people seated in the covered or open space or both. [4]
368. **Retail Shop:** A premises where sale of commodities, directly to the consumer, takes place and includes space for necessary storage of goods. [2]
369. **Revenue Forest:** The forest revenue system is closely linked to the issuance of harvesting permits, which are based on inventories and farm inspections. This permit system is meant to ensure that harvesting is only allowed at a sustainable level. Thus, it is a mechanism to control and limit the exploitation of forest resources. [21]
370. **Revenue Village:** 'village' means any local area whether compact or otherwise, recorded as a village in the revenue records of the district concerned, and includes an area which the State Government may, by general or special notification, declare to be a village. [21]
371. **Right of Way:** (a) The total width of the strip of land designated as a road, railway, waterway, or a public utility, (b) The legal right to pass through the grounds of another under certain circumstances. [41]
372. **Risk:** A possibility of loss or damage arising from a specific action, processes or situation that could be economic, social cultural, environmental or political. [59]
373. **River:** A natural water body that carries water collected from its catchment area to another river or sea and on the way, serves the irrigation, drinking water and other needs of the people. [16]
374. **Road Hierarchy:** is a means of defining each roadway in terms of its function such that appropriate objectives for that roadway can be set and appropriate design criteria can be implemented.
375. **Road/ Street:** Any highway, street, lane, pathway, alley, stairway, passageway carriageway, footway, square, place or bridge whether a thorough-fare or over which the public have a right of passage or access or have passed and have access uninterruptedly for specified period, whether existing or proposed in any scheme and includes all bends, channels,

- ditches, storm water drains, culverts sidewalks, traffic islands, roadside trees and hedges, retaining walls fences, barriers and railing within the street lines. [4]
376. **Room:** A space defined by walls, roof and floor. [4]
377. **Row Homing:** A houses with only front, rear and interior open spaces. [4]
378. **Rules:** means a rule made under the relevant act by the State Government or the State Authority. [1]
379. **Run-off:** The portion of precipitation that flows over the land surface or in open channels. [62]
380. **Rural Business Incubator (RBI):** is a collaborative programme designed to help the youths with innovative business ideas, new startups, and nano enterprises to succeed in their business goals. We are here to help incubates solve the problems commonly associated with running or starting their entrepreneurial journey by providing support, mentoring, and training.
381. **Rural Tourism:** is a tourism activity in which the visitor's experience is related to a wide range of products generally linked to nature-based activities, agriculture, rural lifestyle/culture, angling and sightseeing.

S

382. **Sanctuary/ National Park/ Safari Park/ Wildlife Sanctuary:** An area of adequate ecological, faunal, floral, geomorphologic, natural, or zoological significance reserved under a Wild Life Protection act, for the purpose of protecting, propagating or developing wild life and the environment. [61]
383. **Sanitary Landfill Site:** A premise where solid waste is disposed of for short or specific period. [62]
384. **Sanitation:** Measures taken to protect public health and include control of insects, rodents, environmental pollution, and management of solid and liquid wastes. [62]
385. **Saw mill/ Timber Mill:** A sawmill (saw mill, saw-mill) or lumber mill is a facility where logs are cut into lumber. Modern sawmills use a motorized saw to cut logs lengthwise to make long pieces, and crosswise to length depending on standard or custom sizes (dimensional lumber).
386. **Scale of Maps:** Depending upon the size of the planning area and the coverage and extent of information required, the scale of maps vary and it generally is - 1: 100,000 to 1:250,000 for regional plans, 1:50,000 to 1: 1 00,000 for perspective plan, 1:10,000 to 1:25,000 for development plan (master plan) and 1: 500 to 1:5,000 plans of projects and schemes. [71]
387. **Scale:** (A) A system or scheme of relative values or correspondence, (b) In a drawing or model, proportional relationship between an actual object and its representation on paper or as a model. [71]
388. **School:** An institution located in a building or a campus of several buildings with or without hostel accommodation, managed by public or private institution, for offering education and play facilities at different levels comprising children of different age groups. [2]
389. **Scrap yard:** A place where old vehicles and machines are collected and either sold or prepared for being used again.
390. **Secondary School:** An institution located in a building or a campus of several buildings, with playing facility, with or without hostel accommodation managed by public or private institution, for offering education and play facilities for children between 11 to 17 years' age studying in VI to X class / standard. [2]
391. **Secondary Sector:** One of the three sectors of economy comprising manufacturing, and household industries. [2]
392. **Sector:** (a) In physical planning, a particular and distinguishable planning unit forming part of division or sub-division of a city for the purpose of equitable spatial distribution of utilities, facilities and services as per population residing or expected to reside there, (b) In economic planning, it refers to the various components of economy, where each is called a sector, and include agriculture, industry, trade and commerce, transport, urban development, rural development, social development, science and technology, and infrastructure. [11]
393. **Semi-detached Housing:** An arrangement of houses using pairs of dwelling units in such a way that two houses are attached by a common wall between them leaving the remaining three sides of each house detached. [4]

394. **Senior Secondary School:** An institution located in a building or a campus of several buildings, with playing facility, with or without hostel accommodation, managed by public or private institution, for offering education and play facilities for children studying in X to XII class/ standard. [2]
395. **Service Centre:** In the context of a region, a town or large village having linkages with its rural hinterland and providing commercial, education, health, communication and recreational facilities and agriculture-related services to the group of villages in the service area. [46]
396. **Service Industry:** A labour intensive economic activity that provides services rather than production of goods and includes printing, photography, health care, film and TV serial making, cold storage, laundry, dry cleaning, repair, servicing and maintenance of equipment and machineries. [46]
397. **Service lane Road:** (a) A road, 7 to 10m right of way, running at the rear side of residential or commercial buildings dedicated for providing services, scavenging in residential areas, or loading and unloading of goods in commercial areas (b) A 2-lane road forming a pan of highway, Merial or sub-Merial road on its either side and dedicated to providing direct access to properties. [41]
398. **Services:** Include transportation by rail, road, air, waterways, telecommunication, police protection, firefighting, postal, and such other services, not covered under utilities or facilities. [2]
399. **Settlement:** A human settlement, whether urban or rural in character. It includes habited villages, towns, townships, cities and the areas notified under the control of the competent authority. [4]
400. **Sewage/ Waste water:** Waste water from all sources - residential, commercial, and industrial or other areas. [11]
401. **Sewage Disposal:** A system of collection, treatment, and safe disposal of sewage. [62]
402. **Sewer:** A conduit pipe or channel, open or closed, carrying sewage or trade effluent. [62]
403. **Sewerage pumping station:** A premise with a pumping station used for pumping sewage on to a higher gradient. It may include, treatment facilities used for treatment of sewage. [62]
404. **Sex Ratio:** Number off males per 1000 males. [20]
405. **Shelter:** A structure that provides bare minimum space for living Shelter and a cover for protection from sun and rain, which may not always be adequate. [20]
406. **Shopping Mall:** One or more buildings forming a complex of shops representing merchandisers, with interconnecting walkways enabling visitors to easily walk from unit to unit, along with a parking area; a modern, indoor version of the traditional marketplace with controlled environment. [4]
407. **Signage:** A well designed display mechanism, located strategically along the channel of movement of vehicle and people, indicating (i) direction to important places, facilities and services, (ii) name of roads, buildings, and sites, (iii) information of tourist interests, or (iv) traffic regulations. [41]
408. **Site:** A well-defined parcel of land or area intended or suitable for development and building construction purposes, the various types of sites by accessibility are Corner Site, Double-Frontage Site, and Interior Site. [2]
409. **Slaughter House:** A facility for the slaughtering and processing of animals and the refining of their by-products. A building used for the for-profit slaughtering of animals that are either raised or transported to the building and the processing and storage of animal products and waste that results from a slaughtering process. (Washoe County, Nev.) [70]
410. **Slope/ Grade:** A raise in elevation within a specific distance generally expressed in percentage. Example: one per cent slope means a rise of one metre in elevation over a horizontal distance of 100 meter. [62]
411. **Slum:** shall mean those areas located within the local body which due to overcrowding, unplanned construction, lack of basic infrastructure and lack of tenurial rights are unfit for human habitation for reasons of health and security and for the above any one or a combination of factors have been notified by the State Government. [36]
412. **Smart City Mission:** is to promote cities that provide core infrastructure, clean and sustainable environment and give a decent quality of life to their citizens through the application of 'smart solutions.

413. **Social Infrastructure:** Social facilities needed for a community and include health care, education, recreation, communication, security, safety, religious and cultural activities, old-age homes, night shelters, cremation and burial grounds and cemeteries. [2]
414. **Social Service:** activities of individuals, groups, NGOs, or Social government agencies that aim at well-being of society especially the poor, deprived, disadvantaged, and may include education, health care, recreation, mother and childcare, and provision of employment opportunities. [2]
415. **Social Welfare Centre:** A premise with facilities for welfare and promotion of community development. It includes healthcare, empowerment, housing and other programs geared towards assisting the poor, unemployed and marginalized in society. It shall be run by a public or charitable institution. [5]
416. **Solid Waste Disposal:** The process of collecting, transporting, processing, recycling, and disposing solid wastes safely in landfills or incinerators. [62]
417. **Solid Waste Management:** A holistic approach to the issue of solid wastes and includes reduction of waste generation at source, segregation, collection, transportation, recycling, and safe disposal. [62]
418. **Solid Waste Treatment Plant:** A premise where solid waste is collected treated mechanically/ electrically and processed for reuse. [62]
419. **Solid Waste:** Solid materials discarded from houses, business establishments, industries, gardens and forests, construction sites and other places and it does not include excreta. [62]
420. **Special Areas:** (a) In city planning, areas designated as such that need unique and specific development norms, rules and regulations and include city core requiring redevelopment, or a heritage area needing conservation, (b) In regional planning, areas designated in the regional plan that require unique and specific policies and programmes and approaches for their planning and development and include hill areas, coastal areas and tribal areas, and environmentally sensitive areas. [2]
421. **Sports Centre:** A premise having facilities for training and coaching for different indoor and outdoor games including swimming. It shall also include centre for physical education. [2]
422. **Sprawl:** The haphazard outward physical growth around a large city in a disorderly fashion. [2]
423. **Stadium:** A large building with tiers of seats for spectators at sporting or other recreational events. [4]
424. **Stakeholder:** An individual or group of individuals who has an interest in and can influence the decisions pertaining to the government activities, programs and objectives. [21]
425. **Statutory Town:** All administrative units that have been defined by status as urban like Municipal Corporation, Municipality, Cantonment Board, Notified Town Area Committee, Town Panchayat, Nagar Palika etc., are known as Statutory Towns. [20]
426. **Storage or Warehouse Building:** It means a building used or constructed or adapted to be used either ordinarily or occasionally for the storage or sheltering of goods, wares, merchandise or any other similar activity, including servicing, processing or repairs incidental to such storage, warehouses, cold storages, freight depot, transit sheds, store houses / garages, hangars, truck terminals, grain elevators, barns and stables. [4] [3]
427. **Storey:** The portion of a building included between the surface of any floor and the surface of the floor next above it, or if there be no floor above it, then the space between any floor and the ceiling next above it. [4] [3]
428. **Stream:** "stream" includes- (i) river; (ii) water course (whether flowing or for the time being dry); (iii) inland water (whether natural or artificial); (iv) sub-terranean waters; (v) sea or tidal waters to such extent or, as the case may be, to such point as the State Government may, by notification in the Official Gazette, specify in this behalf. [38]
429. **Street:** (a) A means of access to abutting properties, (b) A transport link connecting various areas of a city. [41]
430. **Surface Water Drain:** A drain carrying surface water including storm water. [62]
431. **Swimming Pool:** A pool or tub constructed either above or below grade and having a capacity of 5,000 or more gallons. [4]
432. **SWOT Analysis:** An analysis that highlights the strengths, weaknesses, opportunities and threats pertaining to an area, project, or policy initiative. [2]

T

- 433. **Taxi/ Taxi Cab/ Cab:** (a) A car llvailable for hire, (b) A para-transit hired mode of transportation run by a private operator, available on demand for hire. [41]
- 434. **Tear Fault:** occurring in the rocks above a low-angle thrust fault and striking approximately at right angles to the strike of the thrust fault.
- 435. **Telecommunication:** Communication of voice, data and images through telephone and other methods. [51]
- 436. **Telephone- Exchange-:** A building with all necessary equipment and office space to provide telephone service to an area. [5 1]
- 437. **Temple:** A building or a complex of building with related infrastructure including parking and serving the public as a place of worship. [52]
- 438. **Thematic Map:** A map representing information penaining to an area on a specific theme like soil characteristics, or land use and the like. [5]
- 439. **Tent House:** A retail facility on higher order road which is used for providing tents are made of a thin fabric which is anached to supporting ropes or to potes. It is used in various functions to protect people from rain, wind, and the cold climate. It may also include the dining sets, foldable tables, dustbins, portable water and sanitation materials, decoration material, etc. It must have adequate space for loading / unloading in shop.
- 440. **Tertiary Sector:** covers a wide range of activities from commerce to administration, transport, financial and real estate, business and personal services, education, health and social work.
- 441. **Textile-industry:** An industry primarily concerned with the design, production and distribution of yarn, cloth and clothing. [46]
- 442. **Topography:** The shape of the surface of the earth in a given area. [71]
- 443. **Topology:** In GIS, the spatial relationships between connecting or adjacent coverage features, e.g., arcs, nodes, polygons, and points. [5]
- 444. **Tourists:** A socio-economic activity initiated by desire to travel and enjoy the places of natural beauty and / or architectural, historical, religious, and socio-cultural significance. [8]
- 445. **Tourism characteristic activities:** are those productive activities whose principal output is characteristic of tourism.
- 446. **Tourist Circuit:** is defined as a route having at least three major tourist destinations which are distinct and apart. Circuits should have well defined entry and exit points. A tourist who enters should get motivated to visit most of the places identified in the circuit.
- 447. **Tourist Flow:** refers to the spatial patterns of tourists visiting a city.
- 448. **Town:** A small urban settlement in the hierarchy - mega-city, metropolis, city, and town, functioning as a service centre to the surrounding rural areas and housing people engaged in non-agricultural activities. [20]
- 449. **Township:** An urban extension to a large city that may be within or outside its administrative boundary and may have both urban and rural characteristics. [2]
- 450. **Traffic Congestion:** Overcrowding of vehicles and other activities that obstruct free flow of traffic along a route at a given point of time. [41]
- 451. **Traffic Volume:** The number of vehicles, in passenger car units, passing a road in both directions. [41]
- 452. **Traffic Volume Count:** Traffic data is essential to calculate traffic intensity based on initial prevailing traffic and to project the traffic for the design period. This survey results in finding the Average Daily Traffic (ADT) & Average Annual Daily Traffic (AADT) from Survey Data
- 453. **Traffic:** To and for movement of people or vehicles in an area, or along a route that could be a road, rail, waterway, or airway. [41]
- 454. **Training Centre/ Training Institute:** A public or private establishment equipped with all necessary physical facilities and technical, administrative and financial resources, for imparting training. [36]
- 455. **Transport Network:** The pattern of transport routes, links and facilities in an area. [41]
- 456. **Transport System:** The total transport network in an area including all modes of transportation to cater to the movement of goods and people. [41]
- 457. **Travel Behaviour** refers to the way in which tourists behave according to their attitudes before, during and after travelling.

458. **Travel Time:** The length of time taken to travel between two points. [41]
459. **Tree:** A woody plant, generally taller than 2 metre, with well-distinguished trunk. [48]
460. **Trip:** One-way travel from one point (origin) to another (destination) for a specific purpose, the destination of one trip becomes the origin of the next. [41]
461. **Truck terminal I Transport Nagar:** A premise for parking of trucks on short term or long-time basis. It may include agency offices, workshops, dhabas, spare part shops, godowns, petrol diesel filling stations, restaurants, guest houses, hotels and such other operational facilities as decided by the Authority. [2]
462. **Tube well:** A system to extract water from underground sources using mechanical means. It may consist of a room for operation and maintenance. [62]
463. **Tuition Centre:** Means an educational institution which specifically provides educational guidance or assists a pupil of a school or educational institution or any person to prepare for an examination. Private educational institutions which offer tutoring in various subjects and preparation for specific tests and examinations.

U

464. **Unauthorised Development:** 'Unauthorised Development' means such use of land or use of building and construction of building which are not relevant to the sanctioned plans or without obtaining the sanction from Competent Authority or in contravention of the Master Plan or Zonal Plan or layout plan, or as the case may be, and it also includes encroachment [78].
465. **University:** "University" means a University established or incorporated by or under a Central Act, a Provincial Act or a State Act, and includes any such institution as may, in consultation with the University concerned, be recognised by the Commission in accordance with the regulations made in this behalf under The University Grants Commission Act, 1956. [36].
466. **Urban Area:** Urban areas are comprised of two types of administrative units - Statutory Towns and Census Towns. a) Statutory Towns: All administrative units that have been defined by statute as urban like Municipal Corporation, Municipality, Cantonment Board, Notified Town Area Committee, Town Panchayat, Nagar Palika etc., are known as Statutory Towns. b) Census Towns: Administrative units satisfying the following three criteria simultaneously are treated as Census Towns: i) A minimum population of 5,000 persons, ii) 75 percent and above of the male main working population being engaged in non-agricultural; and iii) A density of population of at least 400 persons per sq.km (1,000 per sq. mile). [20]
467. **Urban Agglomeration:** refers to the population contained within the contours of a contiguous territory inhabited at urban density levels without regard to administrative boundaries.
468. **Urban Form:** The three-dimensional shape of an urban area evolved out of the urban design characteristics and the spatial arrangement of land uses and activities. [2]
469. **Urban Growth:** Physical expansion, generally unplanned, of a city as a result of increase in its population and socio-economic activities. [2]
470. **Urban Local Bodies:** are small local bodies that administer or govern a city or a town of a specified population. Urban Local Bodies are vested with a long list of functions delegated to them by the state governments.
471. **Urban System:** A set of interconnected urban settlements extending over a designated area - regional, national or international serving a role in the development process depending upon their functional hierarchy. [2]
472. **Urban:** (a) Belonging to a town or city, as defined in census of India. [20]
473. **Urbanisation:** refers to the concentration of human populations into discrete areas. This concentration leads to the transformation of land for residential, commercial, industrial and transportation purposes.
474. **Use Zones:** Areas designated in a development plan or layout plan for a specific land use that could be residential, commercial, industrial, recreational, and related to transport, and facilities and services. [54]
475. **Utility:** Services such as roads including approach roads, bridges, bypasses and underpasses, street lights, water supply system, sewerage system, storm water drainage

system, electrical network, communication network, sewage treatment plants, percolation wells, solid waste disposal system, collection, treatment, discharge and disposal of industrial, institutional and township waste, gas pipeline, common effluent treatment plants (CETP), spaces for informal services, and any other as may be delineated by the Government. [2]

V

476. **Vacant Land:** A public or private parcel of land that is not used for any purpose or has not been designated in an approved development plan for a specific use at a given point of time. [2]
477. **Vector:** In GIS, a coordinate-based data structure commonly used to represent linear geographic features where each linear feature is represented as an ordered list of vertices. [5]
478. **Vegetable Fruit Market:** A premise for retail sale of fruits and vegetables in shops or platforms. [54]
479. **Vehicle Occupancy:** The number of people travelling in a car, bus, or other vehicle. [41]
480. **Vehicle:** Any means of transportation of people and goods that may be driven by any source of power-human, animal, petrol, diesel, gas, electricity and others. [41]
481. **Vending Zone:** means an area or a place or a location designated as such by the local authority, on the recommendations of the Town Vending Committee, for the specific use by street vendors for street vending and includes footpath, side walk, pavement, embankment, portions of a street, waiting area for public or any such place considered suitable for vending activities and providing services to the general public.
482. **Veterinary Hospital I Dispensary I Clinic:** A premise offering medical and similar facilities for animals. In other words, veterinary is used to describe the work of a person whose job is to treat sick or injured animals, or to describe the medical treatment of animals. A premise having medical facilities for indoor and outdoor treatment of pet animal and birds. It may be managed by a public or charitable institution or on community basis [2].
483. **Vocational Institute:** A premise with training facilities for short term courses for discipline, predatory to the employment in certain profession and trade. It includes training-cum-work centre. [36]
484. **Volume to Capacity Ratio/ VC Ratio:** The ratio between the actual volumes of traffic in PCUs to the designed capacity of a road. [11]
485. **Volume- count Ratio:** is a measure that reflects mobility and quality of travel of a facility or a section of a facility. It compares roadway demand (vehicle volumes) with roadway supply (carrying capacity). For example, a V/C of 1.00 indicates the roadway facility is operating at its capacity. It is a common performance measure for MPOs and is widely used in CMS and transportation studies.

W

486. **'Ward:** Subdivision of a city into physically identifiable boundaries based upon population for the purpose of municipal elections, collection of property taxes, and grassroots participation in local development process as envisaged under Constitution (Seventy fourth Amendment) Act 1992. [37]
487. **Warehouse Godown:** A premise for storage of goods and commodities in a manner as per requirement of respective goods/ commodities. The premise includes loading and unloading facilities. [46]
488. **Wasteland:** Barren land not fit for agriculture purposes and not occupied by any other use. [45]
489. **'Water Bodies:** Water body means surface waters including rivers, streams, lakes, marine waters, estuaries and wetlands. Water body means a lake, reservoir, wetland, or a geographically defined portion of a river or stream. [21 J]
490. **Water Concentration:** Protection, development, sustainable use and efficient management of water resources. [38]
491. **Water Management:** The technical, administrative and fiscal arrangement for procurement, processing and distribution of water in an area. [38]

492. **Water Pollution:** Means such contamination of water or such alteration of the physical, chemical or biological properties of water or such discharge of any sewage or trade effluent or of any other liquid, gaseous or solid substance into water (whether directly or indirectly) as may, or is likely to, create a nuisance or render such water harmful or injurious to public health or safety, or to domestic, commercial, industrial, agricultural or other legitimate uses, or to the life and health of animals or plants or of aquatic organisms. [38]
493. **Water Pumping Station:** Water pumping stations are machines that can be used to transport water from one site to another, without needing direct human or animal input. These devices can supply water to canals, circulate water in treatment systems and can even drain water from low-lying land. [62]
494. **Water Supply Augmentation:** is planned placement of recycled water into a surface water reservoir used as a source of domestic drinking water supply.
495. **Water Supply System:** The entire arrangement for supply of water from a source at one end to an outlet at the other and includes water reservoir, treatment facility, pumping facility, storage, and network of pipes for distribution, control valves, fittings and fixtures. [62]
496. **Water Supply:** (a) The quantity of water available from all sources to meet the water demand of a community for all purposes. (b) The processes of provision, treatment, storage and distribution of water to a settlement for domestic, industrial, commercial and other purposes. [62]
497. **Water Table:** The upper surface of groundwater in an area at a given point of time. [62]
498. **Water Treatment Plant:** The facility for treatment of water to ensure that it is potable. In other words, a waste water treatment plant cleans sewage and water so that they can be returned to the environment. These plants remove solids and pollutants, breakdown organic matter and restore the oxygen content of treated water. [62]
499. **Water Treatment:** The processes of cleansing water for human consumption. [62]
500. **Way:** A passage to a building or site, which may or may not be motor able, (b) A manner, system or method of doing something. [41]
501. **Weekly Market:** An area used once a week by a group of informal shop establishments in the form of a market. These markets may shift from one area to another on different days of the week and may be planned at designated places in land uses. [67]
502. **Weigh Bridge:** A premise with weighing facilities for empty or loaded trucks. [41]
503. **Wholesale Market/ Mandi:** A premise from where goods and commodities are sold/ delivered to retailers. The premise includes storage, godown, loading and unloading facilities. [70]

Z

504. **Zonal Development Plan:** Zonal Plan is a plan detailing the proposals of Master Plan and acting as a link between Master Plan and the Layout Plan. A zonal development plan may- (a) contain a site-plan and use-plan for the development of the zone and show the approximate locations and extents of land uses proposed in the zone for such things as public buildings and other public works and utilities, roads, housing, recreation, industry, business, markets, schools, hospitals and public and private open spaces and other categories of public and private uses; (b) specify the standards of population density and building density; (c) show every area in the zone which may, in the opinion of the Town and Country Planning Department or any other agency appointed/ nominated by the State Authority, be required or declared for development or re-development; and (d) in particular, contain provisions regarding all or any of the following matters, namely, (i) the division of any site into plots for the erection of buildings; (ii) the allotment or reservation of land for roads, open spaces, gardens, recreation-grounds, schools, markets and other public purposes; (iii) the development of any area into a township or colony and the restrictions and conditions subject to which such development may be undertaken or carried out; (iv) the erection of buildings on any site and the restrictions and conditions in regard to the open spaces to be maintained in or around buildings and height and character of buildings; (v) the alignment of buildings of any site; (vi) the architectural features of the elevation or frontage of any building to be erected on any site; (vii) the number of residential buildings which may be erected on plot or site; (viii) the amenities to be provided in relation to any site or buildings on such site

whether before or after the erection of buildings and the person or Authority by whom or at whose expense such amenities are to be provided. [1]

505. **Zone:** means anyone of the divisions in which a development area may be divided for the purposes of development under the relevant act.
506. **'Zoning'** refers to municipal or local laws or regulations that govern how real property can and cannot be used in certain geographic areas.

Definition of any term related to development and construction which is not mentioned here, will be followed as defined in National Building Code (NBC)/ Urban and Regional Plan Formulation and Implementation Guidelines (URDPFI) Model Building Byelaws as well as in IS/BIS.

REFERENCES

1. The Uttarakhand (Uttar Pradesh) Urban Planning and Development Act, 1973
2. Urban and Regional Plan Formulation and Implementation Guidelines, Vol 1, Ministry of Housing and Urban Development, Government of India, 2014.
3. Uttarakhand Building Bye laws (Amendment), 2016, vol. 1, Uttarakhand Legislative Assembly, 2011.
4. Model Building Byelaws, Ministry of Housing and Urban Development, Government of India, 2016
5. AMRUT Design and Standard, Ministry of Urban Development Government of India, 2016
6. 73rd and 74th Constitutional Amendment Act, Government of India, 1992
7. Zoning Regulations and Development Controls for Master Plans in the State of Punjab, Department of Town & Country Planning, Government of Punjab, 2018.
8. Uttarakhand Tourism Policy, 2016.
9. Master Plan of Delhi 2041 (Draft), Delhi Development Authority, 2021.
10. Central Pollution Control Board, Revised Classification of Industrial Sectors, 2016.
11. The Uttarakhand Special Provisions for Urban Bodies and Authorities Act, 2018.
12. Affordable Housing in Partnership, Scheme Guidelines, Government of India, 2013
13. The Maharashtra Entertainment Duty Act, 1923
14. National Building Code, Vol. 1, 2016
15. National Bank for Financing Infrastructure and Development Act, 2021
16. River Basin Management Bill, 2018
17. The Biological Diversity Act, 2002
18. Building Construction and Development Regulation, 2011
19. The Cantonments Act, 1924
20. Census of India Metadata, 2011
21. Uttarakhand (Uttar Pradesh) Revenue Code, 2006
22. Disaster Management Act, 2005
23. The Electricity Act, 2003
24. The Environment (protection) Act, 1986
25. Reservation for Economically Weaker Sections (EWSs) in direct recruitment in civil posts and services, Office Memorandum, 2019
26. Heritage Conservation and Preservation Act, 2010
27. The Uttar Pradesh Regulation of Money Lending Act, 1976
28. The Mines and Minerals (Development and Regulation) Act, 1957.
29. Land Acquisition Act, 1894
30. Micro, Small and Medium Enterprises Act, 2006
31. The Constitution of India
32. Petroleum Rules, Government of India, 2002
33. National Public Private Partnership Policy, Ministry of Finance, Government of India, 2011
34. The Railways Act, Government of India, 1989
35. The Real Estate (Regulation and Development) Act, 2016
36. University Grants Commission Act, 1956
37. The Constitution (Seventy-Fourth Amendment) Act, Government of India, 1992

38. The Water (Prevention and Control of Pollution) Act, 1974
39. Guide lines for Traffic Forecast on Highways, Indian Road Congress. 2014
40. The private colleges (regulation and control) act, 2002
41. Geometric Design Standards for Urban Roads allid Streets, Indian Roads Congress, 2018
42. Uttarakhand (Uttar Pradesh) Municipal Corporation Act, 1959
43. Manual on Road Safety Audit, Indian Roads Congress, 2019
44. Guidelines for Processing Cased for Revision of Design Energy of Hydro Electric Stations.
45. The Waste Lands (Claims) Act, 1863
46. The Industries (Development and Regulation) Act, 1951
47. Police Act, 1949
48. Forest (Conservation) Act, 1980
49. The Irrigation Laws (Amendment) Act, 1964
50. The Indian Wireless Telegraphy Act, 1933
51. Places of Worship (Special Provisions) Act, 1991
52. Gobardhan Framework by Swachh Bharat Mission (Grameen), 2021.
53. The Punjab Regional and Town Planning and Development Act, 1995
54. Agricultural Produce (Grading and Marketing) Act, 1937
55. Dam Safety Act, 2021
56. Guidelines, Pradhan Mantri Awas Yojana (Urban), Ministry of Housing and Urban Affairs, 2021

1 PROJECT BACKGROUND

1.1 INTRODUCTION

The urban population will be the driver of the Indian economy, contributing about three-fourths of the GDP by 2030. With such perspectives in sight, the Government of India (GoI) has launched various urban development schemes such as Smart City Mission and Atal Mission for Rejuvenation and Urban Transformation (AMRUT). They are intended to create new urban clusters, renew existing urban scenarios and improve the overall quality of life by ensuring basic amenities like water supply, sanitation, urban transport, development of green space & parks, capacity building improvement programs, etc. to the residents. The total population of the state is 10,086,292 as per Census 2011 and of this, nearly 30% of them reside in urban areas. As per Census 2011, the state has 92 Urban Local Bodies (ULB) and a total of 41 Census Towns. The state comprises 7 class 1 towns with Dehradun being the capital city of Uttarakhand state and the one with the highest population of 5,69,587 as per Census 2011. MDDA jurisdiction covers Mussoorie and Dehradun, but the GIS based master plan is prepared only for Dehradun comes under Amrut 500 cities. For the purpose of clarity consultant is preparing two separate reports for Mussoorie and Dehradun. This report is solely focuses on Dehradun planning area.

Dehradun is nestled between the Himalayan foothills to the north and the South. The town offers breath-taking scenery. Dehradun is situated at an altitude of 1400 ft. in the MDDA Planning Area. The town also serves as a convenient base for visiting the area's many tourists' sites. It is well connected and close to Himalayan tourist destinations like Mussoorie and Auli, as well as Hindu holy cities like Haridwar and Rishikesh and the Himalayan pilgrimage circuit of Chota Char Dham.

Following rapid urbanisation and economic growth, the Government of Uttarakhand (GoU) intends to regulate the development process in its urban settlements in order to ensure that these urban settlements continue to serve their purpose without causing inconveniences and difficulties to the population and administration. Dehradun, as the interim capital and the state's largest urban agglomeration, requires special attention, and it is with this in mind that the Government of Uttarakhand has invited consultants to support them in the preparation of the GIS-based Base Map, Master Plan, and Zonal Plan for the planning area under Mussoorie Dehradun Development Authority (MDDA).

1.2 NEED FOR GIS-BASED MASTER PLAN

The Master Plan/Development Plan is the primary tool for urban land management, providing detailed land use allocation for the city's or town's long-term development. A base map of the planning area that is accurate and up to date, showing road and building layouts, the spatial extent of development, and information on the use of each parcel of land, among other things, is required for developing a Master Plan. The Master Plan is a constitutional instrument, according to the provisions of the Uttarakhand Urban and Country Planning and Development Act 1973.

Dehradun is a city that is constantly changing and becoming more complex. Continuous urban development necessitates the spatial information of the Dehradun city on GIS portal, which aids in decision-making for both public and private entities. GIS helps to analyse the town's current situation and future needs for economic and social infrastructure and mitigation of the impact of traffic and transportation issues and natural disasters.

1.3 PROJECT OBJECTIVE

The main objectives of GIS Based Master Plan are:

1. To formulate a statutory document with a set of strategic guidelines to validate systematic planned development in the planning area, which is sustainable, eco-friendly, and conducive to economic growth.
2. The Master Plan attempts to meet the emerging challenges of urban infrastructure and focuses on efficient land-use planning, environmental conservation, regeneration, and

improving the quality of life by creating resilient and efficient infrastructural systems with sufficient provision of amenities and other community services while upholding the social, community and cultural considerations.

3. To ensure the protection & restoration of the city's historic architectural heritage & natural assets.
4. The proposed Master Plan will be structurally in tune with the physiography of the development area in order to contain a human vulnerability in the event of natural disasters. The entire physical proposals of the development plan will be prepared on a GIS platform for ease of storage, accuracy, retrieval, analysis, manipulation, and updation over time.

1.4 SCOPE OF WORK

Scope includes the data analysis of primary and secondary information, recommendations and proposals for the Dehradun Planning Area, Population, economy, environment, basic services and amenities, traffic and transportation, and land use, which will be based on the public participation, surveys, ongoing and completed projects, issues and challenges of different sector of the Dehradun city. Main aspects come under scope are mentioned below:

1.4.1 Spatial Attribute Collection and Vetting of Base Map

To provide authenticity to the information, value-addition of spatial features will be done through collection of attributes and the same will be vetted by competent authority for further usage. The layer-wise spatial attributes as per the Performa given in Design – Standards under AMRUT will be collected from the field by the Consultant, so that the draft final base map can be generated which can be used as an input to the plan formulation. Utilisation of Very High-Resolution Satellite (VHRS) Data for preparing large scale Urban base map at 1: 4000 scale or better on GIS platform.

1.4.2 Urban Data Base Creation

Urban and socio-economic data is an input to be used to study the existing situation, identification of issues and formulation of proposals and projections. While most of the data to be collected is secondary, some crucial data may be required to be collected from primary surveys. An indicative format for data collection is provided in the guidelines, Data analysis will be presented sector-wise, in the form of chapters in the draft Master Plan document. Databases to be created and surveys to be conducted – including land use survey, socioeconomic, traffic and transport and other surveys will be as per the standard guidelines.

1.4.3 Formulation of Master Plan

The horizon year for the draft master plan will be 20 years. The draft proposals will use existing Master Plan/Zonal/Regional plans, district plans and will incorporate proposals of other departments. The draft master plan will specify the aims and objectives for the development of the city/ town. Contents of the draft master/ development plan document will be as per Urban and Regional Development Plans formulation and Implementation (URDPFI) Guidelines and statutory provisions of the Uttarakhand Urban and Country Planning and Development Act 1973.

1.5 PROJECT APPROACH & METHODOLOGY

Detailed Project Approach and Methodology Adopted for preparation of Master Plan is explained below:

1.5.1 Project Approach

The population of Dehradun in 2001 was 6 lakh and in 2011 was 9.4 lakh. Hence, a Substantial increase in the population (resident as well as floating) in the town and concern for its sustainable growth warrants the adoption of certain approaches and principles, which are listed below:

- a) Decentralized Development
- b) Environmentally and Ecologically Sustainable Development
- c) Rural-urban Integration for balanced development
- d) Reallocation and change in land use as per the changing circumstances
- e) Conservation & management of important heritage/religious structures & natural resources

- f) Land Use zoning
- g) Upgrading the infrastructure and public amenities

The above-mentioned principles are used to define the methodology and activity structure for the preparation of the Master

1.5.2 Project Methodology

This section elaborates on various activities and the corresponding methodology adopted for the preparation and Implementation of the Master Plan for the Dehradun Planning Area. The main 5 stages for preparation and implementation of the Master Plan are:

Stage-1: Project Initiation / Inception

The primary objective of this stage is to initiate the project by finalizing the work plan, methodology, and the familiarization of the project team with the Planning Area. It shall include the following components:

Stage-2: Preparation of Base Map, Existing Land Use (ELU), and Existing Situation Analysis

One of the key prerequisites for the preparation of a suitable Master Plan is the preparation of an accurate and authentic Base Map. An ideal base map should be indicative of and a perfect demonstration of all the existing site features. It should be accurately positioned and mapped and should be based upon an in-depth site

survey. **Figure 1-1: Project Methodology**



In addition to all the spatial features captured in order to generate an accurate base map, this stage shall also aim at carrying out socio-economic surveys, Infrastructure Surveys, Traffic Surveys and Tourism Surveys, which shall eventually help develop a brief existing profile of the planning area.

Stage-3: Preliminary/ Conceptual Master Plan

Information on the spatial spread and dynamics of the land use/land cover is the basic prerequisite for planning and implementing various developmental activities. Land use is essentially the purpose for which land and its resources are employed: for example, farming, mining, or other developmental activities. Land cover describes the physical state of the land surface: as in cropland, mountains, or forests.

The term land cover originally referred to the kind and state of vegetation (such as forest or grass cover), but it has broadened in subsequent usage to include anthropogenic structures such as buildings or pavement and other aspects of the natural environment, such as soil type, biodiversity, and surface and groundwater.

- i. **Vision Formulation Exercise:** The visioning exercise shall give the broader picture, featuring the characteristics of an inclusive urban system providing efficient infrastructure and facilities for the entire population. The exercise shall be undertaken in consultation with stakeholders in the proposed workshops and is expected to reflect the town's potential, unique attributes, and the values, perspectives, and priorities of stakeholders with respect to the future development of the town. All strategies and programs shall be aligned with the vision statement.
- ii. **Formulation of Development Strategies:** The formulation of development strategies is another critical task, which will draw upon previous tasks such as existing situation analysis, visioning and stakeholder consultations. Development strategies shall be defined at this juncture informed by all the above analyses/interactions and shall be the guiding principles for the preparation of proposals in the Development Plan.

Table 1-1: Formulation of strategies

S. N.	Component	Description
1	Stakeholder Consultation & Visioning Exercise	The Development Plan shall cover the perceptions and visions of various stakeholders including civil society, elected representatives, academicians, and government and non-governmental organizations. Based on the existing situation assessment, primary and secondary surveys, and interactions with the local people and key stakeholders (as mentioned above), the vision for the development of the town shall be developed based on which the Development Plan shall be prepared.
2	Strategy Formulation	To achieve the vision derived from the above visioning exercise through Development Plan, various strategies shall be formulated.

Stage-4: Draft Master Plan & Report

Under Stage 4 state wise estimation of the growth of economic activities, employment and population shall be covered, which defined the estimation of required infrastructure according to population increase and economic growth of the city. Proposed land use allocation and transport network shall be provided on the basis of public purposes and revenue generation strategies. Proposed land use also is discussed under this stage where development control regulations and zoning regulations will be also formulated/Implemented in the Strategy making process for the proposed land use plan.

Stage-5: Final Master Plan & Report

The final stage is the last stage of the project with two components:

- Incorporation of suggestions received in Public Consultation Meeting:** After submitting the Draft Master Plan, the Public Consultation/Hearing” will be held, where the development authority will present the plan to the public/stakeholders and will ask for their suggestions/objection’s applications. In a given time of 30 days, all the objection applications will be received and will be considered while preparing the Final Master Plan
- Final Master Plan, Land Use Plan, and Zoning:** The final report shall convey the development of the town in a financially sustainable and time-bound manner by exploring alternative ways of funding, and obtaining land for physical and social infrastructure and shall have the following features:
 - Executive Summary
 - Development plan phasing
 - Preliminary line estimates of physical and social infrastructure, identification of financing and operating mechanism, and funding pattern shall be prepared.
 - The detailed Land Use plan along with the strategy for implementation and funding the development.

The components of every stage of the methodology are explained in Annexure 1.

1.6 REPORT STRUCTURE

The Master Plan of Dehradun - 2041 report is divided into three sections and 14 chapters. Section A of the existing Situation and Land Use Analysis report contains Chapters 1 through 12. Proposals and strategies will be discussed in Sections B and C. Finally, the Final Master Plan Report will include all three sections, beginning with Chapter 1 and ending with Chapter 14.

SECTION – A: EXISTING SITUATION AND LAND USE

Chapter -1: Introduction: This chapter covers project background, objectives of the master plan along with need for GIS based master plan and approaches and stage wise methodology of the project

Chapter - 2: Planning Area Profile: This chapter starts with the introduction of the planning area and its location and regional setting as well as it's urban and rural components.

Chapter - 3: Demographic Profile: It highlights the planning area detailed demographic profile, such as rural-urban population composition and population growth trends. Population projections for the coming year are based on current trends.

Chapter - 4: Economic Profile: This chapter describes the economic foundation of the planning area. For the horizon year, the existing and projected economic base, workforce, and occupational structure, as well as major work areas, are provided.

Chapter - 5: Housing: This chapter focuses on the housing scenario, housing characteristics, available facilities and infrastructure, as well as the slum and urban poor conditions in the city. The chapter also discusses the upcoming year's housing shortages and needs

Chapter - 6: Environment and Ecology: In the planning area, this chapter includes traffic and transportation scenarios. The issues identified through primary survey analysis are discussed, as are potential areas/strategies for development.

Chapter - 7: Tourism and Heritage: This chapter describes the tourism scenario, including information on the various types of tourist attractions found within the planning area. Future tourist inflows are projected, and the necessary facilities and services are discussed.

Chapter - 8: Physical Infrastructure: This chapter discusses physical infrastructure facilities such as water supply, sewerage and sanitation, solid waste management, and power supply. The issues and problems in various infrastructure, as well as the requirement for the horizon year, are discussed.

Chapter - 9: Social Infrastructure: This chapter focuses on the existing social infrastructure facilities in the planning area. The chapter goes into detail about the educational, health, and recreational facilities. The requirement for the horizon year is calculated and presented in accordance with the planning principles.

Chapter -10: Traffic and Transportation: In the planning, this chapter includes traffic and transportation scenarios area. The issues identified through primary survey analysis are discussed, as are potential areas/strategies for future research.

Chapter – 11: Existing Land Use: This chapter explains the processes involved in creating the planning area's base map and existing land map. In addition, existing conditions are examined.

SECTION – B: VISION FORMULATION

Chapter – 12: Vision and Strategies Formulation: Vision and strategies will be formulated under this chapter in context of social and environment development of city Development while keeping environment as a component to formulate proposals.

SECTION – C: MASTER PLAN – 2041

Chapter – 13: Projects Proposal and Phasing: This chapter will define the various time periods of the projects in different phases, Master Plan Implementation and Institutional Framework: The various projects identified for Urban Development institutional, legislation and their financing and revenue generation aspects are detailed out in this chapter.

Chapter – 14: Proposed Land Use: This chapter is to determine the direction of future growth, and future land use is proposed for the horizon year. Development Controls and Zoning Regulation: This chapter lays out a broad policy framework for encouraging planned development. Details of various levels of facilities and amenities, as well as space standards, design and development control, and urban design guidelines, are described.

2 PLANNING AREA PROFILE

2.1 INTRODUCTION: DEHRADUN CITY

Dehradun being the State Capital of Uttarakhand, is one of the largest economic growth centres followed by Haridwar and Nainital. It is one of the “Counter Magnets” of the National Capital Region (NCR) being developed as an alternative centre of growth to help ease the migration and population explosion in the Delhi Metropolitan Area.

Dehradun, India's school capital, has long been a premier educational centre. With over 300 schools, including the Doon School, Welham Boys and Girls Schools, and the Rashtriya Indian Military College (RIMC), it attracts students from both India and abroad. The city is also a popular tourist destination and transit point for visitors travelling to Rishikesh, Haridwar, Mussoorie, and other destinations.

Many of these institutes were established during British period. Indian Military Academic (IMA), Survey of India (Sol), Archaeological Survey of India (ASI), Oil and Natural Gas Corporation Limited (ONGC), Wadia Institute of Himalaya Geology (WIHG), Indian Institute of Remote Sensing (IIRS), Indian Institute of Petroleum (IIP), The Wildlife Institute of India (TWII), Forest Research Institute (FRI), Lal Bahadur Shastri National Academy of Administration (LBSNAA), and many other

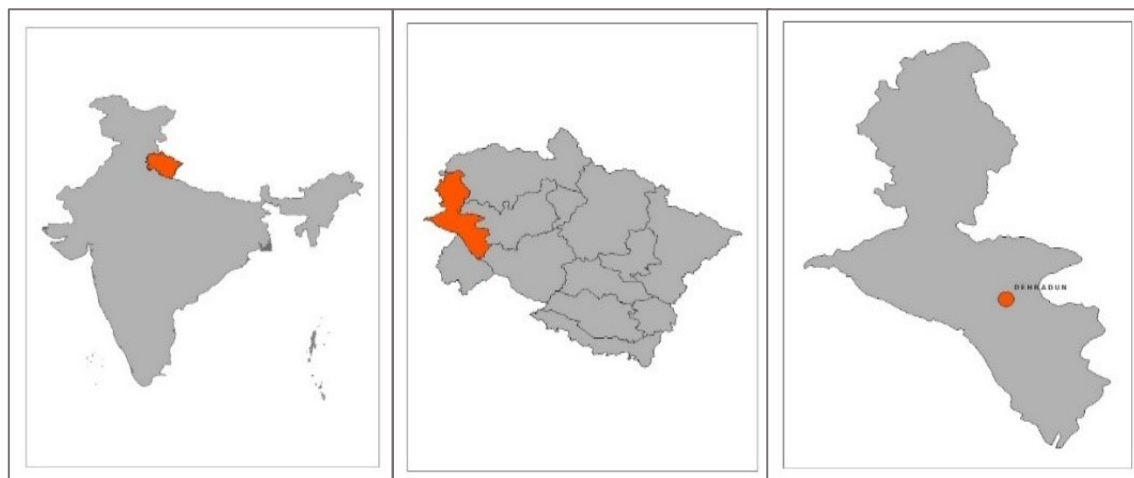
The city's core city area is still burdened by problems such as poor solid waste management, drainage, inefficient sewage treatment, and other sanitation issues. Dehradun made a change in sanitation issues in the previous year, with the state capital's ranking rising from 124 last year to 82 in 2021, but the core area still faces sanitation issues when compared to the city's peripheral areas. Water streams in the city are also polluted as a result of rapid urbanisation and poor civic administration. Seasonal rivers such as Bindal and Rispana, which once ran through the city's heart, have degraded into filthy, garbage-filled drains.

The problems of insufficient public transportation, limited parking spaces, and massive increases in traffic jams are multifaceted and pose enormous challenges on many levels, which are only going to get worse in the future. This has a negative impact on city's development and growth.

2.2 LOCATION AND REGIONAL SETTING

Dehradun City is the interim capital of Uttarakhand, located in the western part of the state in the Doon Valley on the Himalayan foothills nestled between the Song River, a tributary of Ganga on the east and the Asan River, a tributary of Yamuna on the west.

Figure 2-1: Location of Dehradun Planning Area in regional context



2.3 UTTARAKHAND STATE

On November 9, 2000, Uttarakhand was conceived as India's 27th state out of the state of Uttar Pradesh. With many glaciers, rivers, dense forests, and snow-clad mountains, the state has a diverse range of natural resources, particularly water and forests. Because of the numerous Hindu temples and pilgrimage sites, including the famous Char Dham temples of Badrinath, Kedarnath, Gangotri, and Yamnotri, the state is known as "Dev Bhoomi." Initially known as Uttaranchal, the state's name was changed to Uttarakhand in 2006. The state is home to 175 rare aromatic and medicinal plant species. It is also home to rare animal species that are protected by sanctuaries and reserves such as the well-known Jim Corbett National Park, Nanda Devi National Park, and Rajaji National Park, among others.

As per Census 2011, total population of the State is around 1,00,86,292. It is increasing at a decadal growth rate of 18.8% which is similar to national growth rate (17.7%). The Geographical Area of the State is around 53,483 sq.km. Sex Ratio is observed 963 which is higher than the national average (943) while literacy rate is observed 78.82% which is lower than the national average (82.2%).

2.4 DEHRADUN DISTRICT

Dehradun district is located in Uttarakhand and is part of the Garhwal division. It is located at 30°32'N latitude and 78°03'E longitude. According to a 2019 study, this district has 52.09% of its geographical area covered by forest. The district has a land area of 3,088 square kilometres. The district is divided into six sub-districts, 22 towns, and 748 villages. The district's economy is primarily based on agricultural production.

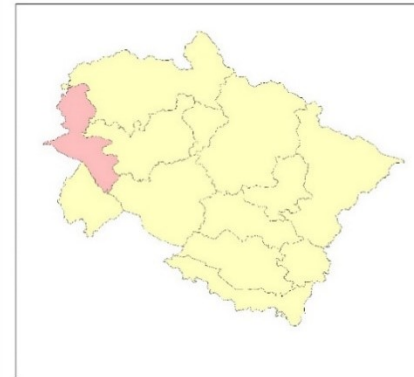
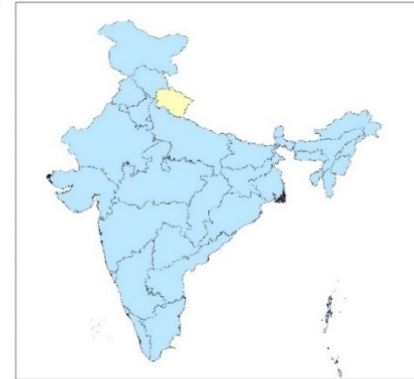
S. No	Major Cities	Distance from Dehradun (in Km)
1	Delhi	255
2	Chandigarh	130
3	Agra	382
4	Haridwar	54
5	Shimla	221

Dehradun is well-connected to the country's capital- New Delhi, Rishikesh, Haridwar, Kedarnath, Badrinath, Uttarkashi, Saharanpur, Roorkee and other significant towns in north India. Road distances to some important cities are given in the above/following table. Apart from all-weather road connectivity, Dehradun is well connected via railways and airways.

Map 2-1: Regional Setting and Connectivity

REGIONAL SETTING AND CONNECTIVITY

PROJECT NAME: MASTER PLAN DEHRADUN 2041



SHEET NAME: REGIONAL SETTING AND CONNECTIVITY

Scale:


Mussoorie Dehradun Development Authority
(MDDA), Uttarakhand

MaRS Planning & Engineering
Services Pvt. Ltd.
B-10, Sector-2, Gurgaon City, Haryana 122 001, India
Email: info@ma.rsplanning.com | www.ma.rsplanning.com
Phone: +91 122 4011111

2.5 MDDA PLANNING AREA

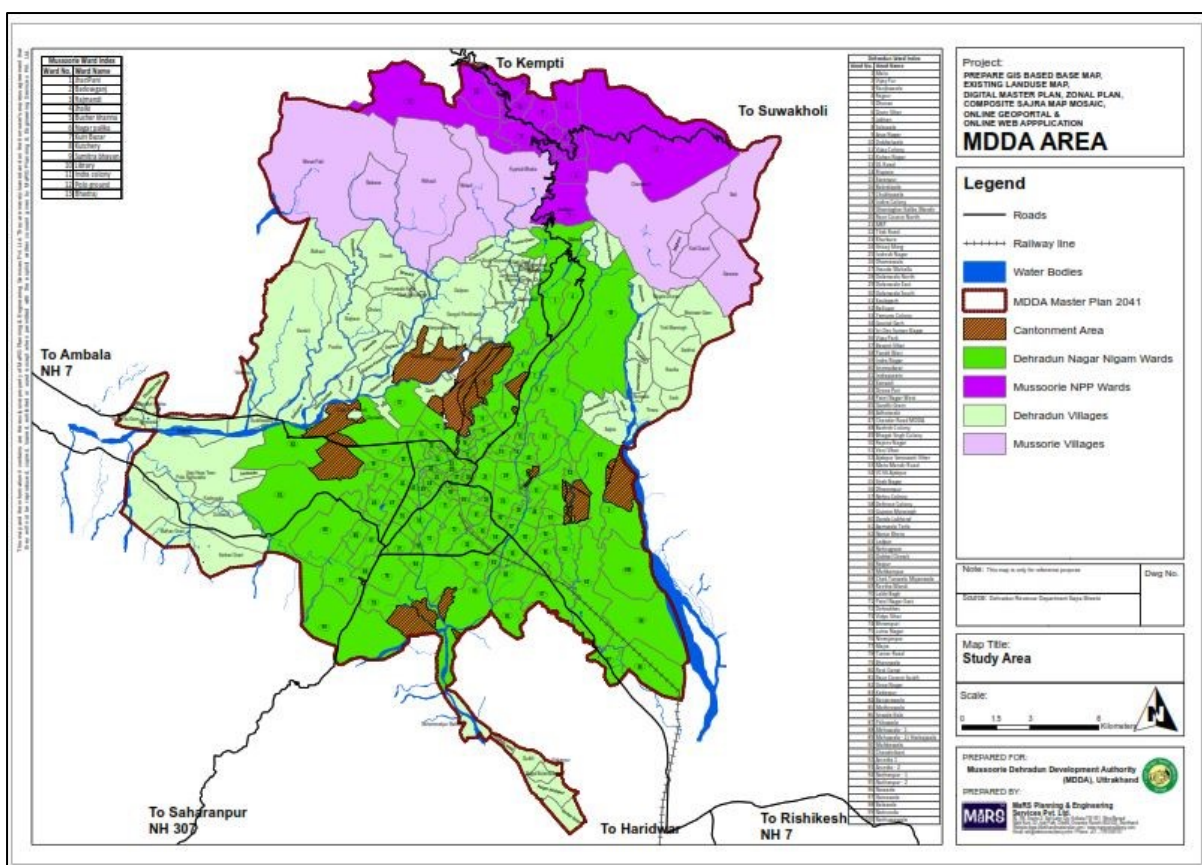
The MDDA Planning Area falls under Dehradun District and comprises of Dehradun Municipal Corporation, Mussoorie Nagar Palika Parishad, Cantonment Board, Clement Town and 102 Revenue Villages. Their details in terms of Area and Population are discussed below:

Table 2-1: Details of MDDA Planning Area

Sr. No.	Category	Area (sq.km.)	Population
1	Dehradun Municipal Corporation (MC) + {Cantonment Board (CB)+ Clement Town (CT)}	(183.7+27.9) =211.6	(804379+75273) = 879652
2	Mussoorie Nagar Palika Parishad (NPP)	50.9	30118
3	Villages	243	73826
Total		505.5	983596

Source: Census 2011 and Final AOI

Map 2-2: MDDA Planning Area



Source: Dehradun Municipal Corporation and Mussoorie Dehradun Development Authority

In 1984, Planning Area of Mussoorie Dehradun Development Authority was notified. MDDA Planning Area Consist of Dehradun Urban Agglomeration (excluding Cantonment Board), Mussoorie Nagar Palika Parishad (NPP) and 185 Revenue Villages. In 2007 and 2018, Municipal

Corporation Boundary has been revised. The Final list of villages is presented in the Appendix 2 with the detailed status.

2.5.1 Dehradun Planning Area

Dehradun Planning Area is consisting of Dehradun Municipal Corporation (including Cantonment Board, Clement town) and 92 Revenue Villages. Their Details are described in the table and figure given below:

Table 2-2: Details of Dehradun Planning Area

Sr. No.	Category	Area (sq.km.)	Population
1	Dehradun Municipal Corporation (MC) + {Cantonment Board (CB)+ Clement Town (CT)}	(183.7+27.9) =211.6	(804379+75273) = 879652
2	Rural areas - Dehradun	166.41	69298.00
Total		378.04	9,48,950

Source: Census 2011 and Final AOI

2.6 REGIONAL CONNECTIVITY AND ADVANTAGES

2.6.1 Road

Dehradun City is well connected to nearby urban centres via National and State Highways. Through NH 7, the city is directly connected to Rishikesh (45 km) and Haridwar City (50 km) in the south-eastern direction, and to Rudraprayag (176 km) and Badrinath (329 km) in the east. The same highway connects to Chandigarh (169 kms west). NH 334 connects Roorkee (70 km), Saharanpur (68 km), and Delhi (334 km) in the south and Ambala (180 kms) in the west.

2.6.2 Rail

Dehradun is part of the Northern Railway Zone and has a terminal railway station on the Northern line of the Northern Railway network. The Zone Head Quarters are located in Firozpur, Ambala, and Moradabad. A portion of the Lashkar-Haridwar-Dehradun section of the Northern Railway's Moradabad division connects Dehradun. The section Lashkar-Haridwar-Dehradun is broad gauge with a single non-electrified line. There are five stations between Haridwar and Dehradun: Motichur, Raiwala, Kansrao, Doiwala, and Harrawala. (Source: From the Doon Ghati Master Plan 2031.)

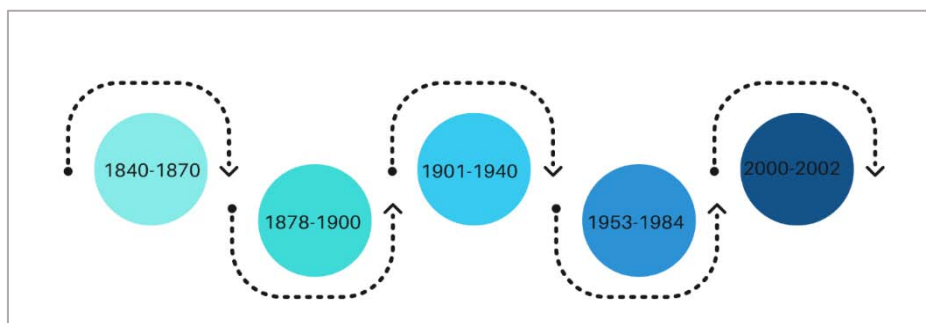
2.6.3 Air

Jolly Grant is the largest commercial airport of Uttarakhand. This airport is located between Dehradun, Haridwar and Rishikesh, about 27km, 39km and 21km from the respective cities. Daily several flights operate from here by various air lines such as: IndiGo, Spice Jet, Air India, Jet Airways towards Delhi, Mumbai, Ahmedabad, Hyderabad, Kolkata, Bengaluru etc. Its near proximity to various tourist places enables tourists to fly into Uttarakhand instead of travelling by rail or road.

2.7 HISTORICAL BACKGROUND OF DEHRADUN

Dehradun has gone through several revolutionary changes in the last century that can help to put the city's future into context. Mussoorie was established by the British in 1842, and the Municipal Board Act went into effect in 1850, under which various municipalities were established throughout India, including Dehradun and Rajapur in 1867 and the Hrishikesh town area in 1908. The increasing industrialization that replaced the tea estates and gardens increased population and transformed the once-small towns with unchecked construction and road laying, resulting in an uncontrolled load on the environment.

Figure 2-2 : Historical Background of Dehradun City



1840 to 1870 - In 1842, the British constituted the municipality of Mussoorie and the Municipal Board Act came into effect from 1850 under which various Municipalities were established all over India including the ones at Dehradun and Rajapur in 1867.

1878 – 1900 - The Forest Rangers Training Institute, later known as the Imperial Forest School, was founded. Many national level institutions were established in the valley at the turn of the twentieth century. After the year 1900, the first train ran between Haridwar and Dehradun Railway Station, Dehradun came under the umbrella of the then British government's All India Postal Network, and the valley's first radio station became operational in the Kutchery Compound.

1901 – 1940 - Another watershed moment in Doon was 1901, when telephone bells first rang in the valley, while television had to wait until 1975, when the Mussoorie TV Tower was built. (Ruskin Bond told me that the first train brought his grandfather to the city.) After 1940, the first superior quality limestone mine was established, and this activity eventually became the primary economic driver. Unregulated mining and deforestation, on the other hand, caused rapid deterioration of the environment and posed a serious threat to the indigenous ecosystem. The second came after Partition, when refugees from Pakistan were settled in the Prem Nagar area in the outskirts of Dehradun.

1953 – 1984: In the decades following independence, as the city's population grew, more industrial units were built, including textile mills, flour mills, and a major bulb factory. Another boost came in the 1960s, when the Oil and Natural Gas Company established its national headquarters in the city. The clock tower, a well-known landmark in Dehradun, was completed this year and inaugurated by Lal Bahadur Shastri. Dehradun Urban Agglomeration, Mussoorie Municipal Area, and its surrounding 185 Revenue Villages of Dehradun District comprise the Mussoorie Dehradun Development Area.

1985- 2000 - The environment ministry notified Dehradun as an "eco-sensitive area" under the Environment Protection Act of 1986 in 1988, making it mandatory for its master plans to be approved by the ministry. The Uttar Pradesh Reorganization Act of 2000 established Uttarakhand state (previously known as Uttaranchal) from the north western districts of Uttar Pradesh. Dehradun was designated as the interim capital. Since the creation of Uttarakhand, the city has seen continuous development.

2.8 PREVIOUS MASTER PLANS

In order to ensure planned and regulated growth in the Dehradun Planning Area, the Government of Uttaranchal was identified as per the Uttarakhand Urban and Country Planning and Development Act, and the planning area was later established via Notification No.255 dated 29 October 1984. The MDDA Planning Area was established in 1984. In 2018, 68 villages were merged into the Dehradun planning area and converted into 40 wards, giving the MDDA area a total of 100 wards. Following that, two Master Plans were prepared, but they failed to adequately focus on environmental aspects, despite the Ministry of Environment & Forests notifying the entire Doon Area as an Eco Sensitive Area via notification S.O.102 (E) dated 1st February, 1989 u/s 3 (2) (v) of the Environment (Protection) Act, 1986 and Rule 5 (3) (d) of the Environment (Protection) Rules, 1986.

Master Plan 2025 is ineffective from 2013. Zonal Development Plan 2025 has been approved and all the building approvals are done based on Zonal plan 2025. The preparation of a new master plan began in 2018.

Table 2-3: Stages of Previous Master Plans

S.No.	Year	Event	Remarks
1	1963	Dehradun Planning Area was declared	Contains: Dehradun Nagar Palika and nearby villages Area: 5 sq.km.
2	1978	163 Villages were added into the Dehradun Planning Area	
3	1984	MDDA Planning Area was established	Includes Dehradun Urban Agglomeration, Mussoorie Municipal area and its surrounding 185 Revenue Villages of Dehradun District.
4	1985	Master Plan was sanctioned for the plan period of 1982 - 2001	Prepared for MDDA Planning Area – As per 1984 Notification
5	1988	Preliminary Doon Valley Notification was issued by the MoEF	Supreme Court Directed Closure to all mines
6	1989	Final Doon Valley Notification was published	
7	2005	Master Plan was prepared for the plan period of 2005 – 2025	Prepared for MDDA Planning Area – As per 1984 Notification
8	2007	City Development Plan was prepared	For Dehradun City only, under JNNURM
9	2008	Master Plan 2025 was sanctioned & came into Force in year 2013	Till Year 2013 this Master was on hold by Ministry of Environment and Forest under Environmental Protection Act 1986
10	2013	Revised Master Plan 2025 was prepared	Till Year 2013 this Master was on hold by Ministry of Environment and Forest under Environmental Protection Act 1986
11	2017	Zonal Plan was prepared based on revised Master Plan of MDDA Area	1.Zonal Plan was prepared only for Dehradun and its adjoining Villages. 2.Not for Mussoorie Area
12	2018	The preparation of the Master Plan 2041 has begun.	for MDDA Planning Area – As per 1984 Notification
13	2019	Doon Valley Special Development Authority and Rishikesh tehsil Merged into the MDDA	
14	2020	Zonal Development Plan was Approved by MDDA.	Building plans are approved by respective departments as per the approved zonal plans.

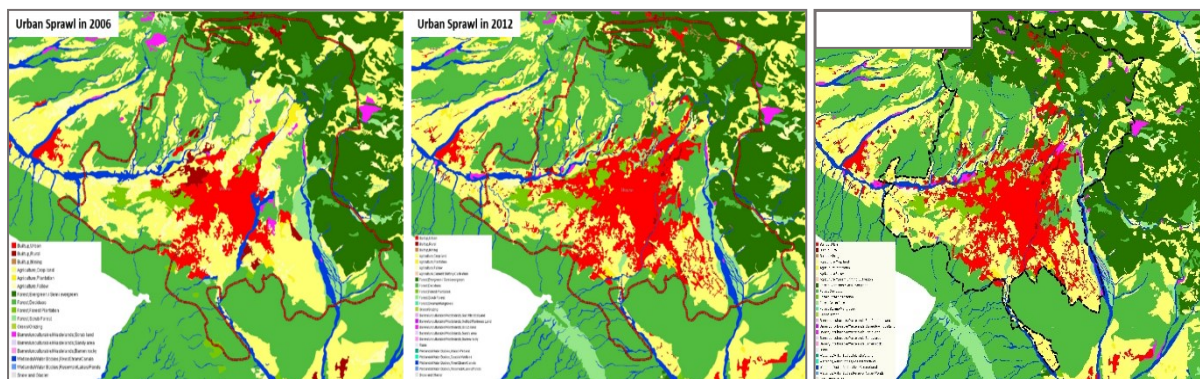
In 2019, Special Area Development Authority and Rishikesh Tehsil merged into the MDDA. Now MDDA includes entire Dehradun District which covers Dehradun MC, Mussoorie NPP, Rishikesh Tehsil Area, Pachwa Doon and Pawva Doon, except Cantonment Area.

2.9 SPATIAL EVOLUTION OF CITIES

Dehradun's urban area nearly doubled in a decade, from 746 ha to 1463 ha, from 1998 to 2008. It has experienced very high growth rates of nearly 32% and 49% in 1998-2003 and 2003-2008, respectively, which is very high when compared to previous time periods. It was because Dehradun had become the interim capital of the newly formed Uttarakhand state in 2001. This change in

status, as well as the government's policy, has attracted a large number of institutional and commercial activities to Dehradun over the last decade. As a result, Dehradun grew into a regional service centre for the entire Garhwal region, attracting a sizable hill population. This unprecedented growth of the urban area has caused chaos, traffic congestion, overcrowding, and mass encroachments on the city's drainage system. The central part of the city is a traditional densely built-up area that has been primarily converted to commercial use, forming the city's Central Business District (CBD). The city's road pattern is radial, with five major transportation corridors radiating from the city centre. Inter-city and intra-city traffic is served by these radial roads.

Figure 2-3 : Spatial Evolution of City



Source: Satellite Imagery 10 Aug 2022, 11:00am

Table 2-4: Spatial Evolution of the city

Year	Growth direction and reasons
Till 1987	The first time period i.e., till 1987 shows more urban built-up growth. Development towards north direction took place due to scenic beauty of Mussoorie hills and west and north-west directions were developed more than other directions due to social preferences as well location of three major government institutes i.e., Forest Research Institute (FRI), Oil and Natural Gas Corporation (ONGC) and Indian Military Academy (IMA) in the vicinity.
1987-1992	The period 1987-1992 could be described as slow growth period.
1992-1998	1992-1998 as very slow growth period in Dehradun's history. During this period, that covers almost a decade, only northern part of Dehradun showed increase in built-up area moreover due to scenic view of Mussoorie hills. During period 1992-1998, almost no sector shows significant urban growth, as this period was largely disturbed due to Uttarakhand movement.
1998-2003	Uttarakhand became the separate state and Dehradun was designated as interim capital, city gained high momentum of growth and development took place in high spurts, even crossing the earlier bounds. Interestingly, during 1998-2003, south and south west direction were preferred and more growth impetus was seen in these directions.
2003-2008	From 2003 to 2008, Dehradun gained more momentum of growth caused by sprouting of many educational and commercial institutes and development of industrial area in Selaqui area of Dehradun on Chakrata road that resulted in development of Dehradun as regional centre in entire region. During this period urban growth could be observed in all the directions except where hills form the physical boundary and restrict development.

Source: Unprecedented Growth of Dehradun Urban Area: A Spatial-Temporal Analysis

2.10 CULTURE AND LIFESTYLE

The majority of Dehradun's residents speak Garhwali and Kumauni. In the region, Hindi is also spoken. As the Hindu religion is practised by the majority of the population, various heritage temples can be found throughout the city. The city's history is intertwined with the Ramayana and Mahabharata periods. The city has a rich cultural heritage as well as traditional values. This city's

distinct flavour and delectable cuisine complete it and draw visitors from all over the world. Kandalee ka Saag, Bal Mithai, Kulath Phanu, Gulgula, Arsa, Kaafli, Singodi, Sani hui Muli, and Nimbu are some of Dehradun's cuisines.

People here hold spiritual significance and are quite traditional in nature. People dress in traditional attire. Ghagra Choli, Lehengas, Sarongs, Bandhani, Sarees, Burkhas, and long skirts are preferred by women. The men dress in Dhoti, Lungi, Turbans, and Kurta Pajamas.

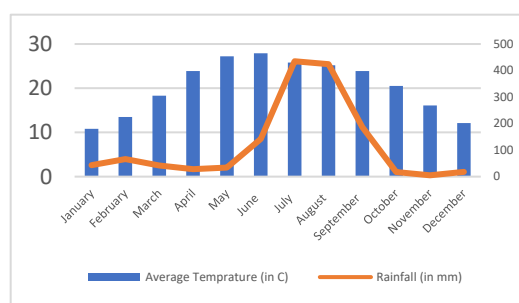
2.11 CLIMATE

As per Doon Ghati Master Plan – 2031, Dehradun lands resting at the middle of Ganga and Yamuna rivers in the valley, offering plains type of climate temperature tends to rise in accordance with the annual season cycle by mid of March and is at peak by mid of June. Monsoon prevails from mid-June till September. Temperatures are low from November till February. As a result of vast forest cover and micro climate, valley often receives rainfall other than monsoon which keeps the weather pleasant throughout the year and is a significant reason for present tourist thrust.

2.11.1 Temperature and Precipitation

In Dehradun and its nearby villages, maximum temperature is observed around 25 to 30 °C in the month of May & June. While minimum temperature is observed in the month of January. In terms of rainfall, maximum precipitation is observed in the month of July & August which is around 430 mm. Details are described into the figure which is given below.

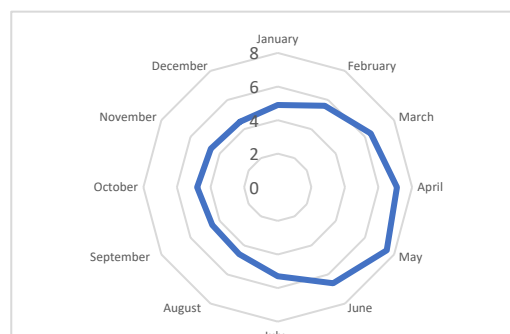
Graph 2-1: Annual Average Temperature and Rainfall



2.11.2 Humidity

In Dehradun & its nearby villages, maximum humidity is observed also into the month of August which is around 82% and minimum humidity is observed in to the month of March which is around 21%. Details are described into the figure which is given below.

Graph 2-2 Wind Speed (mph)



2.11.3 Wind Speed and Direction

To understand land use land, cover the data from 1995 to 2020 is taken into consideration. The statical analysis of the study area shows that the urban area has increased many folds. The forest cover has decreased from 1995 to 2020. While the major increase in urban areas is due to the conversion of barren areas and agricultural lands into urban area.

2.12 NATURAL RESOURCE

Dehradun is well known for its natural resources, as it is surrounded by such dense green forests. Dehradun is best known for its Basmati rice and Lychees, which grow in abundance throughout the district. Furthermore, with the Himalayas and the Shivalik's to its north and south, Dehradun has an abundance of natural resources in the form of forest, energy, and soil. Furthermore, with renowned institutions in the city such as the Indira Gandhi National Forest Academy, Forest Survey of India, National Hydrographic Office, Oil and Natural Gas Corporation, and Indian Institute of Remote Sensing, Dehradun's natural resources are carefully utilised. Magnesite, Limestone, and Gypsum deposits can also be found here.

2.13 PHYSIOGRAPHY AND SOIL

In Dehradun, the topography, sun direction, and soil characteristics collectively impart the region's rich vegetation. Surface water conveniently sinks into the depths of loose boulders and seeps at

the bottom of the valley which makes an impermeable band of clay come up to the surface. The abundant rainfall and presence of numerous water bodies provide the basis of rich biomass productivity. This rich vegetation cover in turn helps in the effective management of heavy rainfall and contributes to groundwater recharge.

Because topography varies so greatly, erosion intensity, Soils have a variety of characteristics that vary depending on parent material and other factors. Many aspects, particularly textures and depth, differ. Colour, stoniness, drainage, moisture status, and organic matter are all factors to consider. soil contains and has the capacity for cation exchange The three major categories are the Lesser Himalaya, Middle Himalaya, and Upper Himalaya. The Shivalik Belt and the Boulder Belt are two of the valley's belts the geological band.

3 DEMOGRAPHIC PROFILE

3.1 INTRODUCTION

The development of a particular city, town or a region depends upon natural, physical and socio-economic factors. Among these factors, population assumes significance in determining the future pattern of progress and development of the city. The Demographic profile of the planning area has been prepared based on the information derived from different sources such as Census of India, economic survey of India and others. Population projection is projected on basis of Decadal Change, Decadal Growth Rate, Compound Annual Growth Rate.

3.2 POPULATION PROFILE AND DISTRIBUTION

As per the Census of India 2011, population of the Dehradun Planning area is 9.48 lakh persons. Population Distribution in Dehradun Planning Area is described in to the sections given below:

3.2.1 Urban and Rural Population

As per Census 2011, total population of Dehradun Planning Area is around 9,48,950. Among them 8,79,652 is the Urban Population and 69,298 is the Rural Population. Further details are described into the table given below:

Table 3-1: Population Distribution

Category	1971	1981	1991	2001	2011
Dehradun MC	169827	220530	270159	426674	804379
Villages Merged into the MC	69919	97273	143953	143268	
Cantonment Board	33637	43566	43031	53675	52716
Clement Town	11898	15450	18237	19569	22557
Sub Total	285281	376819	475380	643186	879652
Rural Population - Dehradun	24569	31395	39464	46494	69298
Total	309850	408214	514844	689680	948950

Source: Census of India

Note: Cantonment Board and Clement Town are not the part of the Dehradun Planning Area. But, during the population projection, employment projection and Calculation of Infrastructure Requirement, entire area needs to be considered as population of cantonment board and clement town may depend upon the Dehradun Planning Area for infrastructure, employment and public amenities.

3.2.2 Ward wise Population distribution

The table below discusses the ward-wise population distribution in Dehradun City. Dehradun City was previously divided into 60 wards. Later that year, the municipal corporation boundary was revised, and 68 villages were merged into Dehradun Municipal Corporation Jurisdictions and converted into 40 wards. Currently, 9,48,950 people live in Dehradun Municipal Corporation's 100 wards.

Table 3-2: Ward Wise Population

Ward_No	Ward_Name	Population 2011	Ward_No	Ward_Name	Population 2011
1	Malsi	6125.00	51	Vani Vihar	6636.00

Ward_No	Ward_Name	Population 2011	Ward_No	Ward_Name	Population 2011
2	Vijay Pur	6820.00	52	Ajabpur Saraswati Vihar	7721.00
3	Ranjhawala	5730.00	53	Mata Mandir Road	6639.00
4	Rajpur	11442.00	54	VCSG Ajabpur	9752.00
5	Dhoran	11839.00	55	Shah Nagar	6642.00
6	Doon Vihar	7558.00	56	Dharampur	7711.00
7	Jakhan	6791.00	57	Nehru Colony	7814.00
8	Salawala	7695.00	58	Defence Colony	8454.00
9	Arya Nagar	7862.00	59	Gujara Mansingh	6712.00
10	Dobhalwala	7334.00	60	Danda Lakhond	5154.00
11	Vijay Colony	8745.00	61	Aamwala Tarla	9971.00
12	Kishan Nagar	9136.00	62	Nanur Khera	7098.00
13	DL Road	7265.00	63	Ladpur	7943.00
14	Rispana	7273.00	64	Nehrugram	7180.00
15	Karanpur	8247.00	65	Dobhal Chowk	7143.00
16	Bakralwala	6833.00	66	Raipur	6655.00
17	Chukhuwala	6358.00	67	Mohkampur	7782.00
18	Indira Colony	8814.00	68	Chak Tunwala Miyanwala	7734.00
19	Ghantaghar Kalika Mandir	8113.00	69	Reetha Mandi	7507.00
20	Race Course North	6827.00	70	Lakhi Bagh	6260.00
21	MKP	6511.00	71	Patel Nagar East	7559.00
22	Tilak Road	8262.00	72	Dehrakhas	7337.00
23	Khurbura	8539.00	73	Vidya Vihar	6972.00
24	Shivaji Marg	9497.00	74	Bhrampuri	8713.00
25	Indresh Nagar	8241.00	75	Lohia Nagar	9453.00
26	Dhamawala	6474.00	76	Niranjanpur	8214.00
27	Jhanda Mohalla	6859.00	77	Majra	10154.00
28	Dalanwala North	9553.00	78	Turner Road	7184.00
29	Dalanwala East	9204.00	79	Bharuwala	7843.00
30	Dalanwala South	7632.00	80	Rest Camp	9254.00
31	Kaulagarh	9041.00	81	Race Course South	9245.00
32	Ballupur	7784.00	82	Deep Nagar	7146.00
33	Yamuna Colony	8022.00	83	Kedarpur	7306.00
34	Govind Garh	8869.00	84	Banjarawala	10310.00
35	Sri Dev Suman Nagar	8445.00	85	Mothrowala	6744.00
36	Vijay Park	7804.00	86	Sewala Kala	8643.00
37	Basant Vihar	7288.00	87	Pithuwala	7395.00
38	Pandit Wari	7238.00	88	Mehuwala - 1	7766.00
39	Indra Nagar	6563.00	89	Mehuwala - 2/ Harbajwala	9610.00
40	Seemadwar	8098.00	90	Mohbewala	7610.00
41	Indrapuram	8970.00	91	Chanderbani	9954.00
42	Kanwali	10327.00	92	Arcedia 1	10367.00
43	Drona Puri	10024.00	93	Arcedia - 2	10385.00
44	Patel Nagar West	10313.00	94	Nathanpur - 1	6284.00
45	Gandhi Gram	10596.00	95	Nathanpur - 2	7621.00
46	Adhoiwala	7612.00	96	Nawada	8984.00
47	Chandar Road MDDA	8210.00	97	Harrawala	7561.00
48	Badrish Colony	7785.00	98	Balawala	6816.00

Ward_No	Ward_Name	Population 2011	Ward_No	Ward_Name	Population 2011
49	Bhagat Singh Colony	7722.00	99	Nakronda	8579.00
50	Rajeev Nagar	7366.00	100	Nathuwawala	9206.00

Source: Dehradun Municipal Corporation and Census 2011

3.3 POPULATION DENSITY

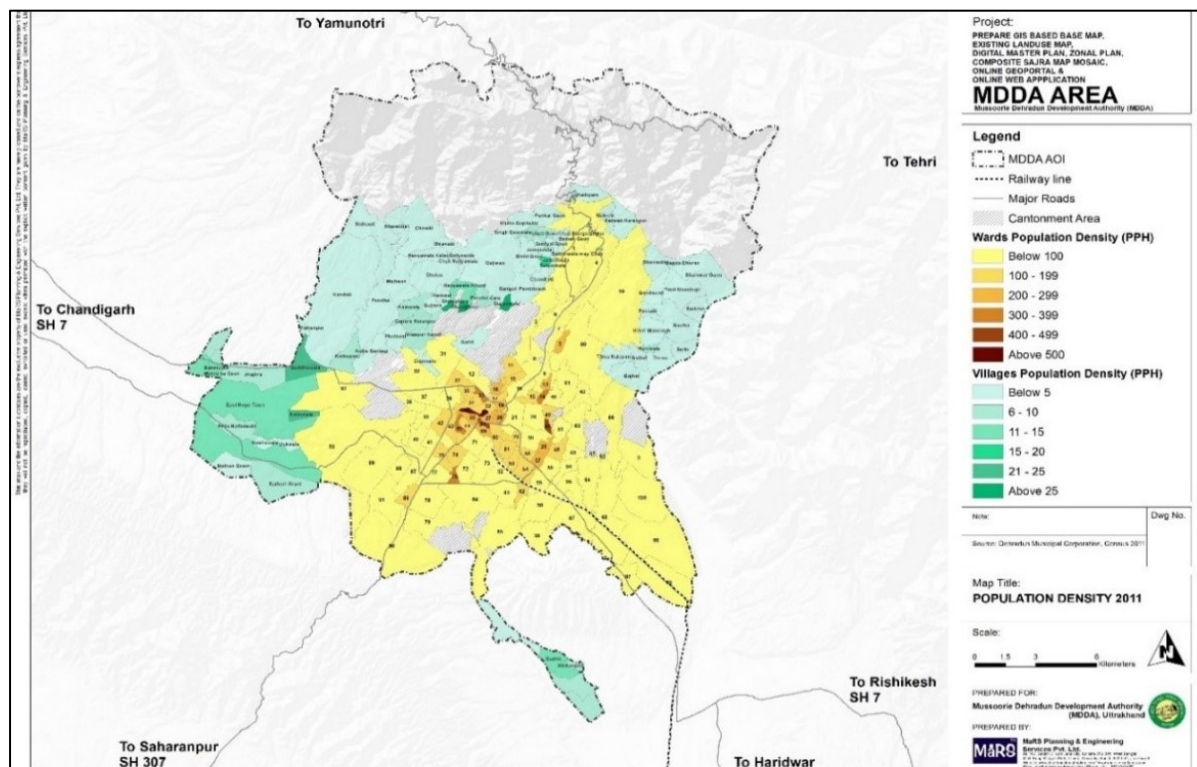
The average density of Dehradun Planning Area is around 25 pph. But, if we calculate for the developed area, density is coming around 75 pph (Gross density). As per URDPFI Norms, for hilly region, developed area density of large cities should be around 60 – 90 pph. So, we can conclude that, developed area density of Dehradun Planning Area is within the desirable limit. But the city's core and periphery have a different situation. The central part of the city, which includes Wards 24, 23, 47, and 75, has a population density of more than 200 people per hectare, while the peripheral area has a population density is of only 4 people per hectare.

Table 3-3: Average Population Density

Description	Population (2011)	Area (sq.km.)	Population Density (Persons per sq.km, 2011 census)	Population Density (Persons per Ha, 2011 census)
Dehradun MC	804379	211.6	3801.41	38
Rural areas - Dehradun	69298	166.4	416.45	4
Average Population Density	—	—	2108.92	21
Cantonment Board	75273	27.9	2697.96	27

Source: Census 2011

Map 3-1: Population Density as per Census 2011



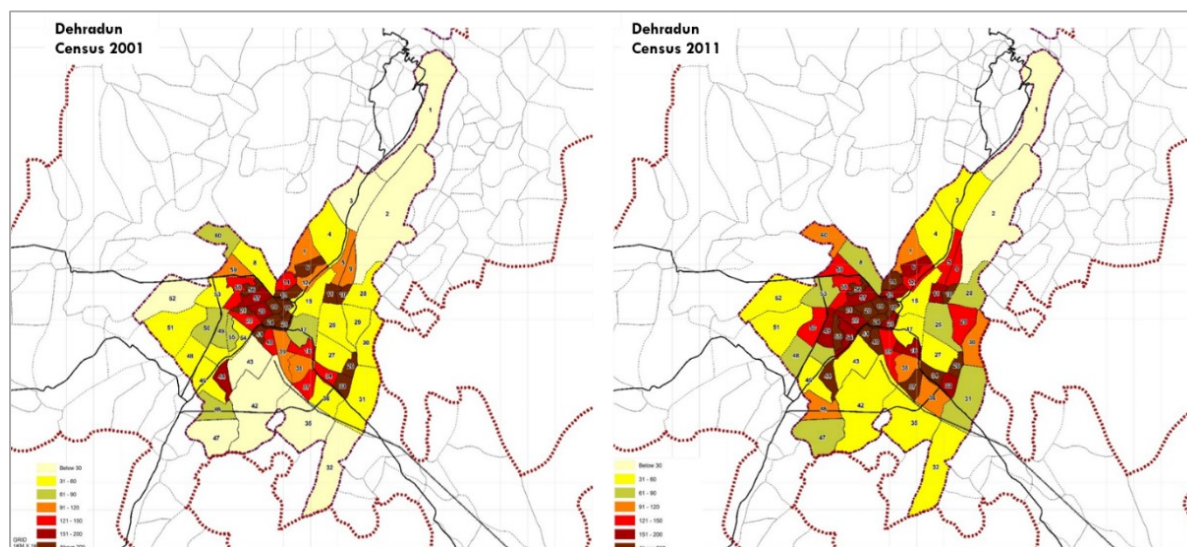
Source: Dehradun Municipal Corporation and Census 2011

Table 3-4: Developed Area Density

Description	Population (2011)	Area (sq.km.)	Population Density (Persons per sq.km, 2011 census)	Population Density (Persons per Ha, 2011 census)
Developed Area	948950	125.43	7841	78.41

Source: Census 2011 and Existing Land Use Primary Survey, 2021

Map 3-2: Population Density Comparison of Dehradun Municipal Corporation



Source: Census 2001 and Census 2011

Map no 3-2 describes the ward-wise population density as of Census 2011, the population density is higher in ward no.24, 23, 47, and 70, as well as within the core city along the State highways (SH 55) and the Rajpur Road. However, in the rural areas, some of the villages on the eastern side (towards Shahaspur) that are closer to the Municipal Corporation Boundary have a population density of more than 125 persons per hac. Aside from that, most villages outside of the Municipal Corporation area have a population density of less than 10 pph.

3.3.1 Population Growth Rate.

On 9th November 2000, Uttarakhand State was formed and Dehradun city was declared as the capital city of the state. The population growth over the years has been displayed below

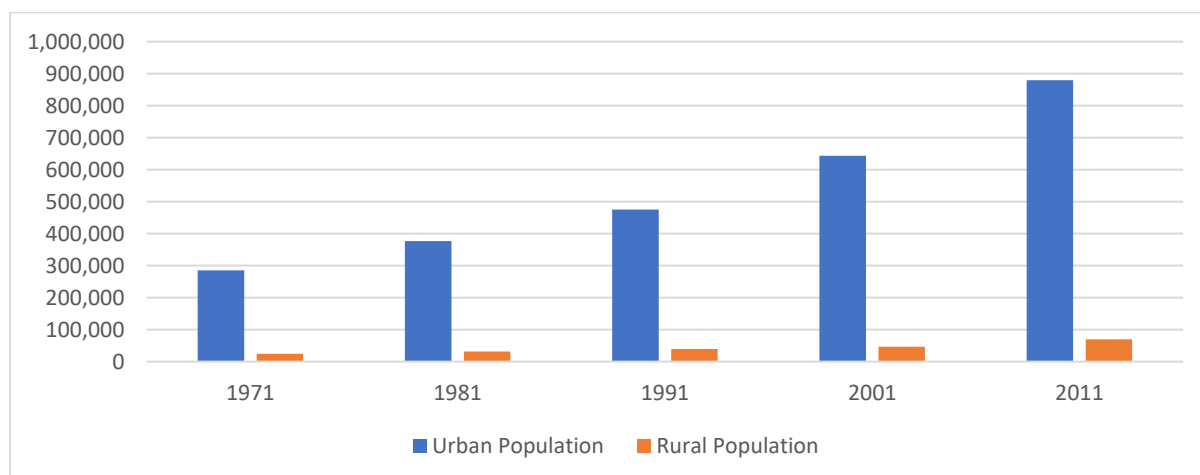
Table 3-5: Population Growth Rate of Dehradun

S.No.	Census Year	Urban Population			Rural Population		
		Urban Population	Decadal Population Change	DGR	Rural Population	Decadal Population Change	DGR
1	1971	285,281	—	—	24,569	—	—
2	1981	376,819	91,538	32.10%	31,395	6,826	27.80%
3	1991	475,380	98,561	26.20%	39,464	8,069	25.70%
4	2001	643,186	167,806	35.30%	46,494	7,030	17.80%
5	2011	879,652	236,466	36.80%	69,298	22,804	49.00%
Average		—	148,593	32.60%	—	11,182	30.09%

Source: Census of India 2011

In Dehradun City, population growth rate considerably increased after 1991. At the same time, population growth rate in the rural areas were considerably low which indicates higher in migration into the urban centre especially in the Dehradun City. The population growth rate of the adjoining areas of the municipality observed in the decade 2001 – 2011 is higher. The rural population after 2001 has increased dramatically with 32% increase in DGR.

Graph 3-1: Rural and Urban Population



Source: Census of India 2011

Population growth has accelerated in recent years as a result of increased industrial and information technology investment. A planned infrastructure and institutional improvement with additional funding from the Asian Development Bank, as well as town development under various development plans and an increase in secondary and tertiary sector possibilities. As shown in the table number 3-5, the population has grown at a faster rate due to migration and natural population growth.

3.4 SEX RATIO

The Dehradun City sex ratio is 907, which is higher than district average and lower than state and national level. Migration rate is high among men for work or education. At the city level the job opportunities in the secondary and tertiary sectors attracts the workers, resulting the higher in migration of male working population from rural to urban.

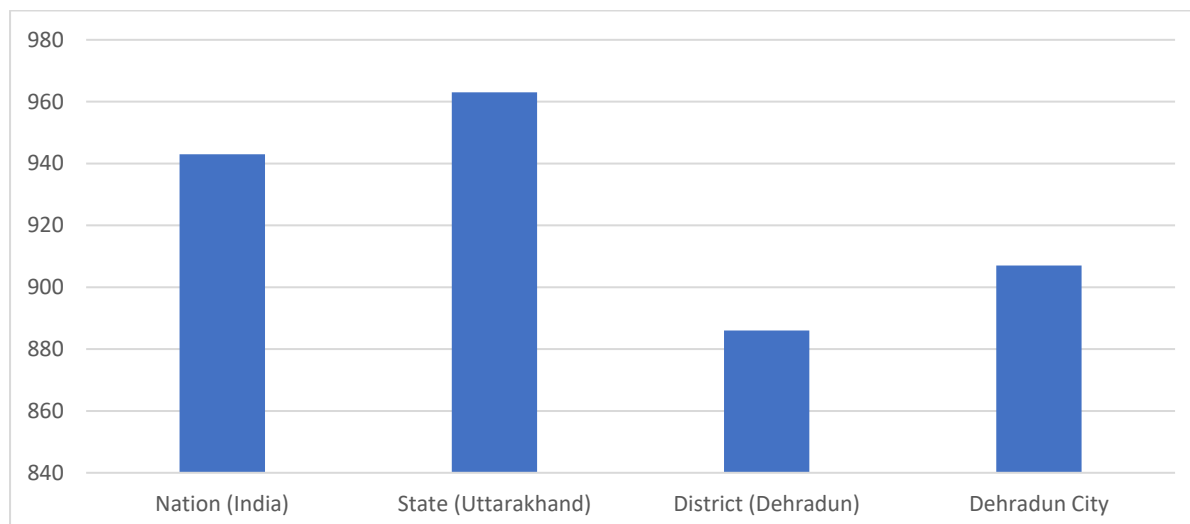
Table 3-6: Sex ratio in comparison to National, State and District's average

Level	Sex Ratio
Nation (India)	943
State (Uttarakhand)	963
District (Dehradun)	886
Dehradun City	907

Source: Census of India 2011

Due to population growth, census data show an increase in the sex ratio in all settlements in the Dehradun planning area in 2011 compared to 2001. The Cantonment Board Areas have a lower sex ratio due to the higher migration rate.

Graph 3-2: Sex ratio in comparison to National, State and District's average



Description	Sex Ratio (2011)
Dehradun MC	908
Rural areas - Dehradun	925
Average Population Density	917
Cantonment Board	775

As per census 2011 data, the sex ratio of Dehradun within the municipal corporation is 908 females after every 1000 males. The rural area and Cantonment Board sex ratio are 925 and 775 females per 1000 males. The average sex ratio of Dehradun is 917.

3.5 LITERACY RATE

Average Literacy Rate of India, Uttarakhand State and Dehradun District is around 74.04%, 79.63% and 85.24% respectively while in Dehradun city, it is around 88%. In Dehradun Planning Area, more than 80% population is literate. Higher Literacy Rate (more than 90%) is observed in to the Cantonment Board Areas while lower literacy rate is observed in villages. As far as the

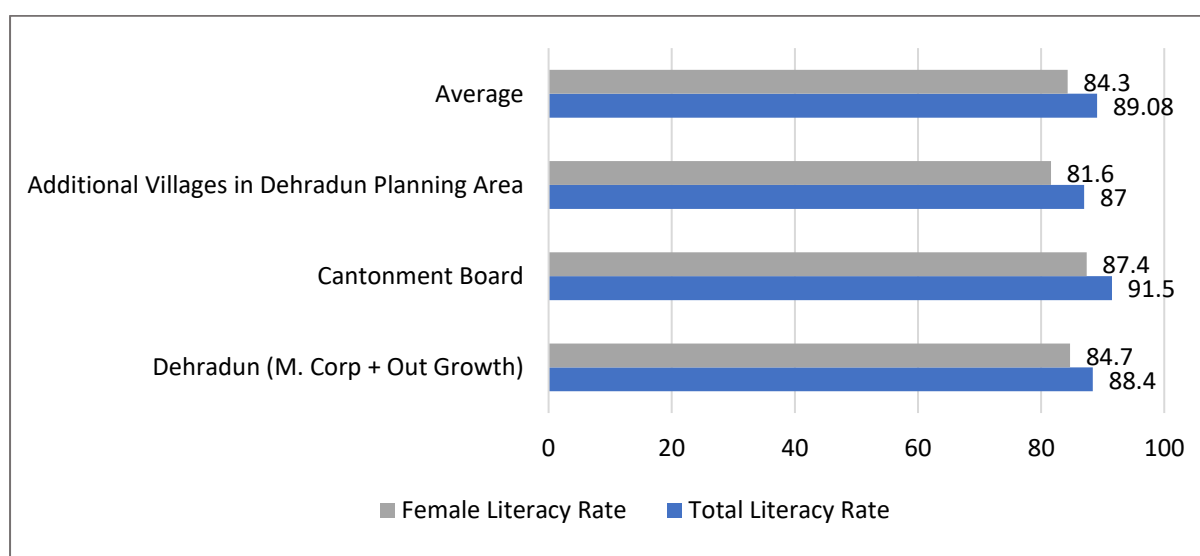
Female Literacy Rate is concerned, the same trend is observed. In comparison to total literacy rate, higher female literacy is observed in the Cantonment Board while least is observed in the villages. The availability of educational institutes and successful government scheme and policies for improving education impacts the literacy rate of the city.

Table 3-7: Literacy rate in comparison to National, State and District's Average, 2011

Level	Literacy Rate
Nation (India)	74.05 %
State (Uttarakhand)	79.63 %
District (Dehradun)	85.24 %
Dehradun City	88.36 %

Source: Census of India 2011

Graph 3-3: Literacy Rate in Dehradun Planning Area



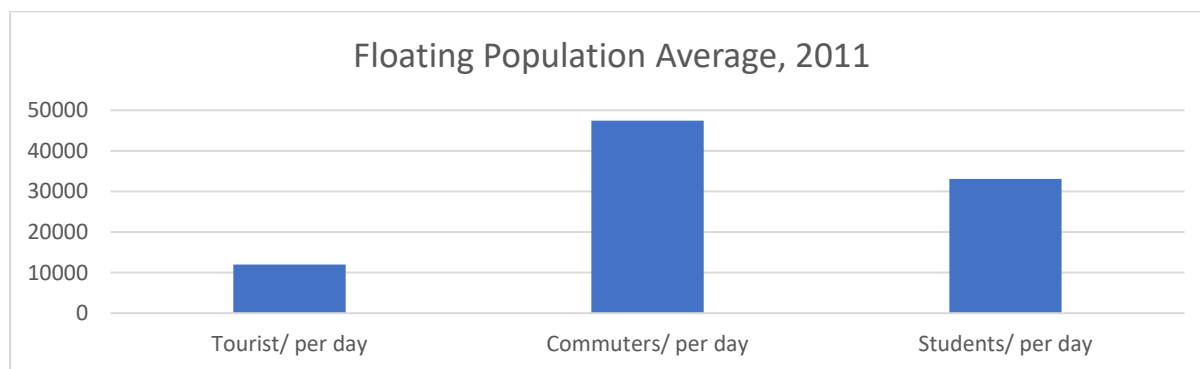
Source: Census of India 2011

3.6 FLOATING POPULATION

Dehradun, the state capital, attracts a large number of tourists each year, with many of them stopping in the city on their way to Mussoorie because it has a number of sites and events that draw people from all over the country and the world, such as the Jhanda Fair, Kalsi, and the Rajaji National Park.

Tourists, commuters, and students make up the city's floating population. Tourism is the most common type of floating population that regularly contributes to the administration's revenue generation. According to the comprehensive mobility plan 2019, 12,000 tourists visit Dehradun per day during peak season, while 1000 tourists visit the city during non-peak season. As shown in Graph No.5, who defines the percentage of city visitors who come for a variety of reasons such as site viewing, education, health services, or market purposes.

Graph 3-4: Floating Population

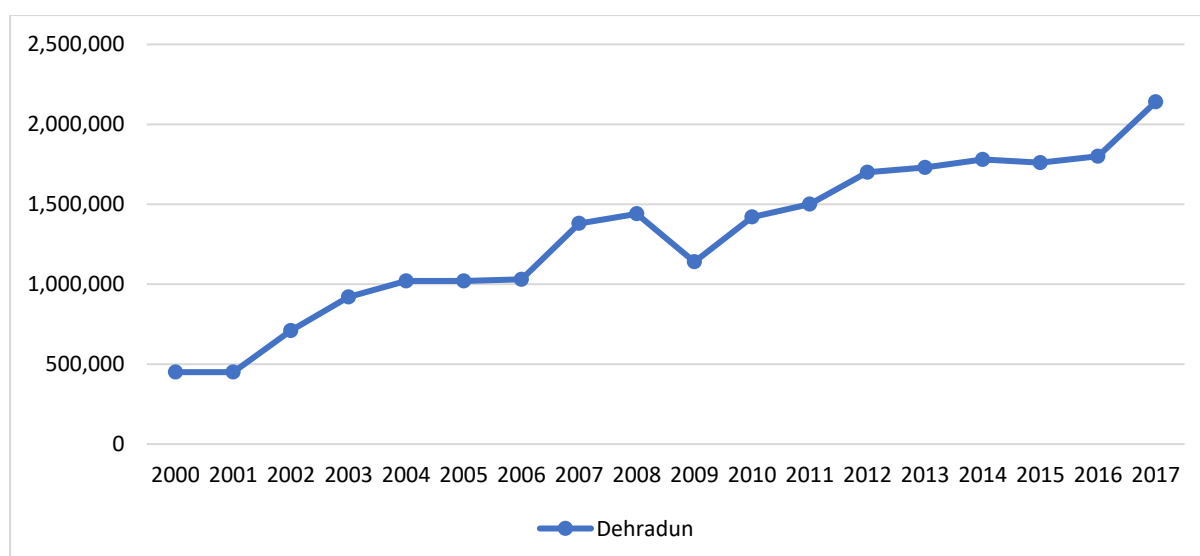


Source: Comprehensive Mobility Plan – 2019,
City Development Plan - 2006

3.6.1 Tourist Population in Dehradun Planning Area

As per Comprehensive Mobility Plan 2019, yearly tourist flow in Dehradun is 21.4 lakh. Among them 98% are domestic tourist. Yearly variation in tourist flow since 2000 is described below. A steady increased is observed except the year 2010.

Graph 3-5: Tourist Population in Dehradun Planning area



Source: Comprehensive Mobility Plan - 201

3.7 ISSUES AND POTENTIAL(S)

1. Demographically, Dehradun Planning Area has been experiencing increased population pressure especially after the formulation of Dehradun City as a State Capital of Uttarakhand.
2. People are migrating to the capital city in search of better job opportunities and more efficient infrastructure, including educational and medical services, which puts enormous pressure on city infrastructure.
3. The core city area's population density exceeds the URDPFI norms, resulting in a negative growth rate in some wards due to a lack of better environment and infrastructure facilities for its residents, which becomes the reason for slum development in core area.
4. Average Literacy Rate of the city is 88.34% which is more than the average literacy rate of the Nation and Uttarakhand State both i.e., 74.04% and 79.63% respectively which depicts that people are literate enough to understand the technology advancement.

5. Management of resources for floating population is also an challenge for administration to cater the visitors and provide them services and infrastructure during the stay period.

3.8 RESIDENTIAL POPULATION PROJECTIONS AND PLANNING NORMS

3.8.1 Projections & Planning Norms Adopted

Projections are an extrapolation of historical data (population v/s time) into the future. The accuracy of population projections is generally considered directly proportional to the size of the existing population and the historical rate of growth, and inversely proportional to the length of the time projection.

The concept of growth of population is often used to connote the change in the number of inhabitations of an area during a specific period of time, irrespective of the fact whether change is negative or positive. Such a change can be measured both in terms of absolute number and in terms of percentage.

Population projections for the project area has been done by different population projection methods as mentioned below:

- 1) Arithmetic Population Projection Method
- 2) Geometric Population Projection Method
- 3) State Increase Population Projection Method
- 4) Incremental Increase Population Projection Method

All these methods have been described in detail ahead along with the population projections for the project area using them.

3.8.2 Existing Population

The population of the urban area reached 8,79,652 in 2011 from 2,85,281 in 1971 indicating an increase in the overall population by about 32.6% from 1971 to 2011. Maximum DGR is observed from 2001 when the Dehradun was declared as the State Capital of Uttarakhand.

Table 3-8: Existing Urban Population - Dehradun

S.No.	Census Year	Population	Decadal Population Change	DGR	CAGR	Incremental Increase
1	1971	2,85,281	—	—	—	—
2	1981	3,76,819	91,538	32.1%	2.82%	—
3	1991	4,75,380	98,561	26.2%	2.35%	7,023
4	2001	6,43,186	1,67,806	35.3%	3.07%	69,245
5	2011	8,79,652	2,36,466	36.8%	3.18%	68,660
Average			1,48,593	32.6%	2.9%	48,309

Source: Census 2011

The population of the rural area reached 69,298 in 2011 from 24,596 in 1971 indicating an increase in the overall population by about 30.9%. Trend of last decade shows that the population has increased especially due to formation of capital of the state of Uttarakhand in 2000.

Table 3-9: Existing Rural Population - Dehradun

S.No.	Census Year	Population	Decadal Population Change	DGR	CAGR	Incremental Increase
1	1971	24,569	—	—	—	—
2	1981	31,395	6,826	27.8%	2.48%	—
3	1991	39,464	8,069	25.7%	2.31%	1,243
4	2001	46,494	7,030	17.8%	1.65%	-(1039)
5	2011	69,298	22,804	49.0%	4.07%	15,774
Average			11,182	30.09%	2.63%	5,326

Source: Census 2011

3.8.3 Residential Population Projection

The population projection has been done using different methods viz. arithmetic projection method, geometric increase projection method, state increase projection method and incremental increase projection method considering the existing situation of the town/city, population size and population growth trends within the project area. The population projected for year 2021, 2031 and 2041 has been done based on the past population trends from year 1971 till 2011.

3.8.3.1 Arithmetic Population Projection Method –

This method is based upon the assumption that the decadal increase in population is constant i.e. the change (increase/decrease) of population with time is constant. Using the past trend of changes in population of an area, the future population is estimated for the area.

A population growing arithmetically would increase by a constant number of people in each period. Arithmetic change produces a linear trend in population growth – following a straight line rather than a curve.

The mathematical formula to calculate population by this method is:

$$P_n = P_o + I * n$$

Where

P_n = population of the future year

P_o = population of the base year

I = Increase/Decrease in Population
(decadal)

n = number of years (decade)

Population Projection by using Arithmetic Method is discussed into the table given below. The Average Population Change from 1971 to 2011 is observed 1,48,593 into the Urban Areas and 11,182 into the Rural Areas. The Projected Population for the year of 2041 by using Arithmetic Method is coming around 13,25,430 in the Urban Areas and 1,02,845 in the Rural Areas.

Table 3-10: Population projection of Dehradun by Arithmetic method

S.No.	Census Year	Urban Population			Rural Population		
		Population	Population Change	DGR	Population	Population Change	DGR
1	2021*	10,28,245	1,48,593	16.9%	80,480	11,182	16.1%
2	2031*	11,76,838		14.5%	91,663		13.9%
3	2041*	13,25,430		12.6%	102,845		12.2%

3.8.3.2 Geometric Population Projection Method

In this method, it is assumed that the percentage increase in population from year to year remains constant. Therefore, the average value of the percentage increase per annum is calculated and the future populations are done at this rate.

In geometric growth, population increments become larger due to its inherent characteristic of compounding. Under arithmetic growth, successive population totals differ from one another by a constant amount whereas under the geometric growth they differ by a constant ratio. In other words, the population total for successive years forms a geometric progression in which the ratio of adjacent totals remains constant.

The mathematical formula to calculate population by this method is:

$$P_n = P_o (1 + r)^n$$

Where

P_n = population of the future year
 P_o = population of the base year
 r = average annual increase in rate of population growth
 n = number of years

Table 3-11: Population projection of Dehradun by Geometric method

S.No.	Census Year	Urban Population		Rural Population	
		Population	CAGR	Population	CAGR
1	2021*	11,65,712	2.86%	89,839	2.63%
2	2031*	15,44,798		116,469	
3	2041*	20,47,162		150,993	

The Average CAGR from 1971 to 2011 is observed 2.86% into the Urban Areas and 2.63% into the Rural Areas. The Projected Population for the year of 2041 by using Geometric Method is coming around 20,47,162 in the Urban Areas and 1,50,993 in the Rural Areas.

3.8.3.3 State Increase Method

The average decadal growth rate during the period 1971-2011 for the State of Uttarakhand was 2.44%. It is assumed that the same will be continued in future for the next three decades i.e., 2021, 2031 and 2041.

Table 3-12: Population projection by State Increase method

S.No.	Census Year	Urban Population	Rural Population	CAGR
1	2021*	11,19,455	88,189	2.44%
2	2031*	14,24,631	112,231	
3	2041*	18,13,001	142,826	

As can be seen from the table above, the population of the urban area will reach to 18,13,001 by year 2041, whereas, the population of the rural area will reach to 1,42,826 by year 2041 by State Increase Method.

3.8.3.4 Incremental Increase Method

The average decadal growth rate during the period 1971-2011 for the State of Uttarakhand was 2.44%. It is assumed that the same will be continued in future for the next three decades i.e. 2021, 2031 and 2041.

Table 3-13: Population projection by State Increase method

Sr. No.	Census Year	Urban Population	Population Change	Increment	DGR (%)	Rural Population	Population Change	Increment	DGR (%)
1	2021*	10,76,554	1,96,902	48,309	22.4	85,806	16,508	5,326	23.8
2	2031*	13,21,766	2,45,211		22.8	107,641	21,834		25.4
3	2040*	16,15,286	2,93,521		22.2	1,34,801	27,160		25.2

As can be seen from the table above, the population of the urban area will reach to 18,13,001 by year 2041, whereas, the population of the rural area will reach to 1,42,826 by year 2041 by State Increase Method.

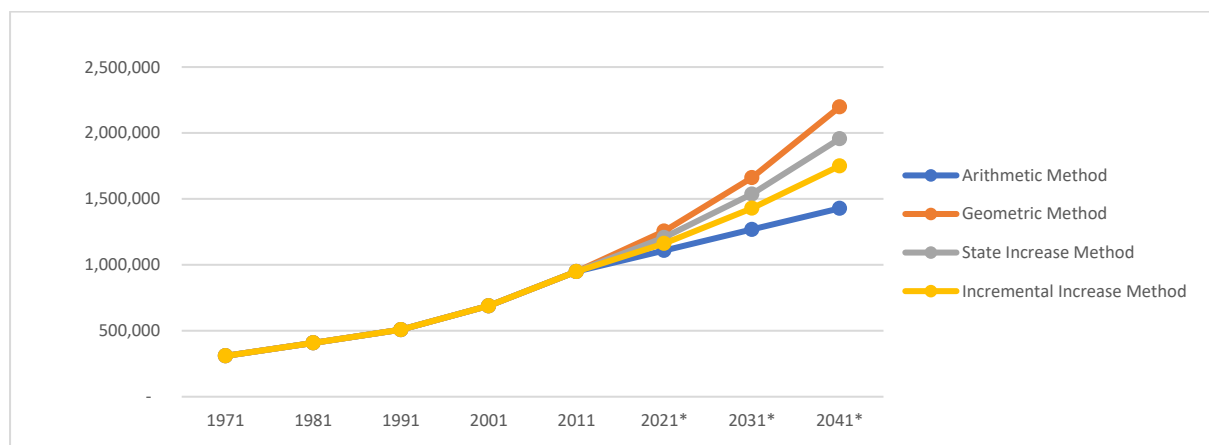
3.8.3.5 Summary of Residential Population Projection

Table 3-14: Total Population Projection through various methods

Year	1971	1981	1991	2001	2011	2021*	2031*	2041*
Arithmetic Method	3,09,850	4,08,214	5,14,844	6,89,680	9,48,950	11,08,725	12,68,500	14,28,275
Geometric Method	3,09,850	4,08,214	5,14,844	6,89,680	9,48,950	12,55,551	16,61,267	21,98,155
State Increase Method	3,09,850	4,08,214	5,14,844	6,89,680	9,48,950	12,07,644	15,36,861	19,55,827
Incremental Increase Method	3,09,850	4,08,214	5,14,844	6,89,680	9,48,950	11,62,360	14,29,406	17,50,087

Total Population Projection through various methods is summarised into the table and chart given below. Projected Population for the year of 2041 by Arithmetic Method, Geometric Method, State Increase Method and Incremental Increase Method is coming around 14,73,020, 22,26,240, 20,27,234 and 18,07,660 respectively.

Graph 3-6: Total Residential Population Projection through various methods



3.8.4 Adopted Residential Population Forecasting Method for projecting demands

The Arithmetic method of value generation is ineffective for representing the actual scenario of proposed population for any city. It demonstrates that the population will continue to grow at a constant rate. While the state increase method represents the state's average growth scenario. Values derived using the Geometric method will be slightly higher, whereas values derived using incremental increase will not be representative of the actual scenario. It demonstrates that decadal population change will remain constant. Keeping in view the upcoming proposals such as metro, which will result in a rapid increase in population, development along the highway, and holistic development in terms of infrastructure and overall lifestyle, the geometric method will be appropriate for population projection.

3.9 FLOATING POPULATION PROJECTION

Dehradun is well-known for its cultural, religious, and tourist attractions. Because it is close to Mussoorie, Rishikesh, and Haridwar, large groups of people visit and live in Dehradun at different times of the year. Because Dehradun is an institution town with numerous educational institutes, there are people who live in the city for a set period of time. Taking all of this into account, the floating population projection is calculated using past and current trends.

3.9.1 Projected Tourist Population

Dehradun and Mussoorie are most popular tourist destinations in the country, it attracts tourists from all over the country as well as other countries. In order to project the requirements for infrastructure (physical and social), it is essential to project the floating population for the horizon year. Sustainable development requires that the capital city is developed keeping in view not only the residential population but also the floating population of tourist.

As per Comprehensive Mobility Plan 2019, yearly tourist flow in Dehradun is 21.4 lakh. Among them 98% are domestic tourist. The current monthly tourist population of Dehradun in 2017 is 1,78,333 (11899 daily – considering 2 days of stay). While average CAGR of Dehradun as of 2017 is 0.95. Considering Average CAGR 1 and average daily population of 12000, the proposed tourist population of the area is described as:

Table 3-15: Proposed Floating Population – Tourist on a Daily basis

Year	Tourist Flow
2011	12,000
2021	13,255
2031	14,642
2041	16,174

The proposed daily tourist population of Dehradun Planning Area for 2041 is around 16,174.

3.9.2 Projected Commuters Population

As Per City Development Plan 2006 of Dehradun City, 5% of the total working population is considered as the commuters. Proposed Commuters for the year of 2041 is described into the table given below (GHK International, 2007). Proposed Commuter Population for the year of 2041 is coming around 1,09,861

Table 3-16: Proposed Commuters Population

Year	Residential Population	Commuters Population
1971	3,09,850.00	15,492.50
1981	4,08,214.00	20,410.70
1991	5,14,844.00	25,742.20
2001	6,89,437.00	34,484.00
2011	9,48,950.00	47,447.50

Year	Residential Population	Commuters Population
2021*	12,55,417.00	62,770.85
2031*	16,60,859.00	83,042.95
2041*	21,97,259.00	1,09,861.95

3.9.3 Total Projected Population

Total Projected Population for the year of 2041 is coming around 23,57,280. The details are described into the table given below:

Table 3-17: Total Projected Population - Dehradun

Category	Existing Population (2011)	Method Adopted	Estimated CAGR	Proposed Population (2021) *	Proposed Population (2031) *	Proposed Population (2041) *
Total - Residential Population	9,48,950	Geometric Method	2.84%	12,55,551	16,61,267	21,98,155
Floating Population						
Tourist/day	12,000	—	1.00%	13,255	14,642	16,174
Commuters/day	47,447	—	5%	62,770	83,042	1,09,861
Students/day	33,090	—	—	33,090	33,090	33,090
Total	10,41,487	—		13,64,667	17,92,042	23,57,280

Project population of 2041 will be considered to project the infrastructure requirement such as Physical, Social Infrastructure, Housing and Transportation infrastructure etc and land requirement as per the URDPFI guidelines

4 ECONOMIC PROFILE

4.1 INTRODUCTION

Economic base of any area is a crucial parameter for its physical development and growth. In order to address the issues of regional development and achieve regional balance, it is vital to gain a deeper understanding of the existing economic structure of the area. As center for economic growth, urban area not only provides major economic opportunities as off-farm employment, but also instrumental the transformation of traditional farming production systems. The dominant sector of economy in Dehradun City is Tertiary sector.

4.2 OCCUPATIONAL STRUCTURE

Dehradun is known as India's education hub and carries a label of "School capital of India", for its institutional activities as many important and well-known institutions are located here like some famous institutes such as: Indian Military Academy, Survey of India, Indian Forest Research Institute etc. Due to these reasons, proportion of student population is quite high in the region. Moreover, it is a gate – way to Himalayan region and hence it attracts a large number of tourists due to that reason, proportion of population engaged into the service industries especially in hotels and tourism related activities are quite high in the region as compare to the other economic sector.

Tourism, information technology, higher education, and banking are the major economic bases in Dehradun, and some people are engaged in primary activities such as agriculture, animal husbandry, and forest produce based furniture and craft items, and other things. Dehradun has an appropriate climate, and the city has experienced strong economic growth in recent decades as a result of increased tourism activities and secondary sector, as well as the establishment of Software Technology Parks of India (STPI), which attracts the majority of the working population from the nearby villages and towns to the Dehradun City.

4.3 WORKFORCE PARTICIPATION

Workforce participation rate (WFPR) is defined as the ratio of total working population to total population. The details of WFPR at various administrative level is described in to the table given below. As we can see from the table, WFPR of Dehradun district and town comparatively less in comparison to state and national average.

Table 4-1: Workforce Participation Rate at various administrative level

Level	Workforce Participation Rate
Nation (India)	39.80 %
State (Uttarakhand)	38.39 %
District (Dehradun)	34.35 %
Dehradun City (M. Corp+OG)	33.93 %

Source: Census of India

(*Note: Data facts are taken from the 2011 Census of India, and for the same reason, the consultant only showed figures for 60 wards.)

4.3.1 Ward Wise Work Force Participation Ratio:

WFPR in various wards are discussed below. As we can see from the table, except ward no. 9, 25 and 46 has WFPR greater than 30%. The highest WFPR is found in ward no. 57 and the lowest is in the ward no. 25.

Table 4-2: WFPR at Ward Level

Ward No.	WFPR (%)	Ward No.	WFPR (%)	Ward No.	WFPR (%)	Ward No.	WFPR (%)	Ward No.	WFPR (%)
1	36.66	13	36.80	25	27.09	37	31.53	49	32.21
2	32.85	14	32.52	26	38.30	38	33.16	50	33.96
3	34.18	15	38.21	27	35.74	39	32.60	51	33.97
4	34.83	16	33.54	28	36.68	40	32.24	52	37.23
5	33.60	17	37.92	29	32.96	41	34.87	53	33.21
6	34.29	18	35.34	30	31.75	42	31.78	54	34.55
7	32.40	19	36.01	31	30.89	43	34.69	55	33.71
8	33.68	20	34.50	32	31.55	44	30.58	56	34.23
9	29.17	21	35.35	33	35.12	45	39.14	57	38.70
10	36.71	22	36.14	34	34.89	46	29.72	58	34.09
11	34.04	23	36.64	35	31.73	47	31.64	59	33.62
12	35.33	24	37.43	36	33.80	48	37.84	60	31.19

Source: Census of India, 2011

(*Note: Data facts are taken from the 2011 Census of India, and for the same reason, the consultant only showed figures for 60 wards.)

4.3.2 Sector-Wise Workforce

As per Census 2011, share of primary (Cultivator and Agriculture labour), secondary (HH Industry Workers) and tertiary sector workers in Dehradun (M. Corp+OG + OG) is around 2.04%, 4.49% and 93.47% respectively. Details of sector wise workforce distribution at ward level is discussed into the table given below.

Ward 40 had the highest percentage of primary workers, while Ward 18 had the lowest. Ward 29 has the most secondary workers, while Ward 40 has the fewest. Because the majority of the population works in tourism-related services, ward no. 60 has the highest concentration of tertiary workers, while ward no. 42 has the lowest concentration.

Table 4-3: Sector Wise Workforce Distribution

Ward No.	Primary Sector Workers	Secondary Sector Workers	Tertiary Sector Workers	Ward No.	Primary Sector Workers	Secondary Sector Workers	Tertiary Sector Workers
1	1.72	2.67	95.62	31	1.33	3.71	94.96
2	2.17	1.82	96.01	32	0.60	3.54	95.86
3	1.72	2.89	95.39	33	0.64	4.31	95.06
4	0.89	3.65	95.46	34	0.68	2.60	96.72
5	1.32	3.71	94.97	35	3.06	8.53	88.41
6	0.98	2.13	96.89	36	1.84	2.61	95.55
7	0.92	3.35	95.73	37	2.31	2.57	95.12
8	1.49	4.22	94.28	38	3.63	9.88	86.50
9	5.29	6.75	87.97	39	2.98	1.89	95.13
10	1.09	2.21	96.70	40	9.30	1.12	89.59

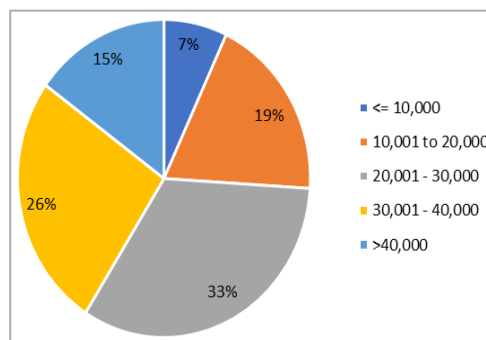
Ward No.	Primary Sector Workers	Secondary Sector Workers	Tertiary Sector Workers	Ward No.	Primary Sector Workers	Secondary Sector Workers	Tertiary Sector Workers
11	0.79	5.31	93.90	41	0.61	4.81	94.58
12	0.49	6.80	92.72	42	6.33	9.95	83.72
13	0.38	2.65	96.97	43	4.27	3.34	92.40
14	0.49	2.48	97.03	44	4.12	3.50	92.38
15	1.13	2.65	96.23	45	1.40	6.25	92.35
16	1.27	2.36	96.38	46	2.55	4.11	93.34
17	0.56	4.13	95.31	47	2.23	9.24	88.53
18	0.37	4.99	94.63	48	2.80	5.01	92.19
19	0.45	4.25	95.30	49	1.27	3.96	94.77
20	1.81	2.16	96.03	50	2.43	3.17	94.41
21	7.99	1.93	90.08	51	1.21	1.94	96.84
22	1.18	2.35	96.47	52	2.48	6.79	90.73
23	0.67	8.04	91.29	53	0.89	3.13	95.99
24	1.95	7.90	90.15	54	0.98	9.43	89.59
25	1.01	3.57	95.42	55	1.43	5.57	93.00
26	0.98	1.99	97.03	56	0.48	2.60	96.93
27	1.25	4.11	94.65	57	2.75	6.45	90.80
28	1.22	5.55	93.23	58	0.83	7.40	91.77
29	1.85	12.44	85.71	59	2.03	2.06	95.91
30	2.82	3.76	93.42	60	0.64	2.14	97.22

Source: Census 2011

4.4 HOUSEHOLD INCOME

As per the socio – economic survey of the Dehradun City for the Master Plan of 2041, around 7% household have monthly HH income less than 10,000 while maximum HH are having it in the range of 20,000 – 30,000 per month. The survey has been conducted after the first wave of COVID – 19 Pandemic. During survey's it has been observed that HH's those are dependent upon the tourism and related activities, industrial and construction workers has been suffered a lot financially during the pandemic.

Graph 4-1: Household Income



Source: HH Survey, 2019

Construction workers and vendors have an income of less than Rs 10,000 per month, while the majority of government officials and tourism sector employees earn between Rs 20,000 and 30,000 per month.

As per the Uttarakhand Economic Survey Report for the year of 2020 – 21, it has been observed that the sudden lockdown led to decrease in income across the state. Around 70% of the sample households has experienced the decrease in the income in the year of 2020 – 21 but now it has

been returned to the pre –COVID levels.as the government are taking measures to retain the economy through various economic schemes and financial supports.

4.5 PRIMARY SECTOR

Major Primary activities in Dehradun are Agriculture Forest and Animal Husbandry. As per the Economic Survey of Uttarakhand State for the year of 2016 – 17, contribution of primary sector of Dehradun district in state GDP is around 7.30%. The details of various primary sectors are given into the sub – sections given below:

4.5.1 Agriculture

Agriculture remains the primary source of income for the majority of the state due to the region's terrain and advantageous climatic conditions. However, cropped land in the Dehradun planning area is significantly lower. Basmati rice, wheat, soybean oil, ground nuts, coarse cereals and pulses, and sugarcane are the major crops, and oranges, peaches, litchees, and plums are the major fruits.

4.5.2 Agriculture produce market

There are eleven functional regulated markets in Kumaon division and nine functional regulated markets in Garhwal division. According to the annual arrival of vegetables, the major vegetable markets are Halwani in Kumaon and Dehradun in Garhwal.

Table 4-4: Agriculture Product Market

District	Principal Markets (Major Mandis)	Sub markets (Minor Mandis)	Weekly Markets
Dehradun	Dehradun	Doiwala	Selkuyi
		Mussoorie	
	Vikas Nagar	-	Raiwala
			Chhidarwala
			I.D.P.L.
	Chakrata	Sahiya	Rani Pokhari
			Baniyawala
			Shyampur
	Rishikesh	-	Ganganagar

Source: Uttarakhand Krishi Utpadan Vipnan Board

4.6 SECONDARY SECTOR

Due to government support in the industrial sector, Dehradun has attracted many investors since its independence. Many industries, particularly agro-based industries and information technology, consider Dehradun to be an appealing destination. Food processing, biotechnology, floriculture, information technology, and tourism are the major industries in Dehradun. Dehradun's total industrial area is 0.834 square kilometres.

Dehradun has maximum industries in MSME sector. As per the Economic Survey of Uttarakhand State for the year of 2016 – 17, contribution of secondary sector of Dehradun district in state GDP is around 13.36%. The details of various industries in Dehradun are discussed into the sub sections given below:

Major Industries Operating in Dehradun District are:

- **Food Processing Industry:** Food processing is a major industry in Dehradun, which is why the government has announced four Agri Export Zones (AEZ) in the district for the following industries: leeches, horticulture, herbs, medicinal plants, and basmati rice.
- **Information and Communication Technology:** The IT Sector in Dehradun is also among the city's top industries. To further promote this industry, the government has announced the establishment of an Information Technology Park in Dehradun.
- **Floriculture and Horticulture:** Dehradun's climate is ideal for growing flowers all year, which is why Floriculture and Horticulture are two of the most important industries in the city.
- **Tourism:** Due to the rapid development of Dehradun in the past 20 years, the tourism sector in the city has increased tenfold. It is now considered a major industry in Dehradun and steps have been taken to further improve the industry.

4.6.1 Industrial parks and estates

Major Industrial estate available within MDDA Planning Area is:

1. IT park, Shahastradhara
2. Government Industrial Estate, Patel Nagar
3. Mohebevala Industrial Estate
4. Spot Zoning Area, Kunawala

In Dehradun District, maximum industries are in Shahaspur and Vikas Nagar areas those are outside the project boundary.

4.6.2 Large industries

There are 17 export-oriented units in Dehradun District. Among them, maximum export has been observed into the field of Oil Field Equipment. As per the details provided by district industrial centre, the total export in terms of finances has been observed around 164.81 cr. in the financial year of 2010- 2011.

4.6.3 Medium and small industries

There are different types of industries located such as chemicals, textiles, food processing, automobiles, packing, plastics, eco-tourism etc. to name a few. Predominant industries are food-processing and Pharmaceuticals. The details are provided into the table given below:

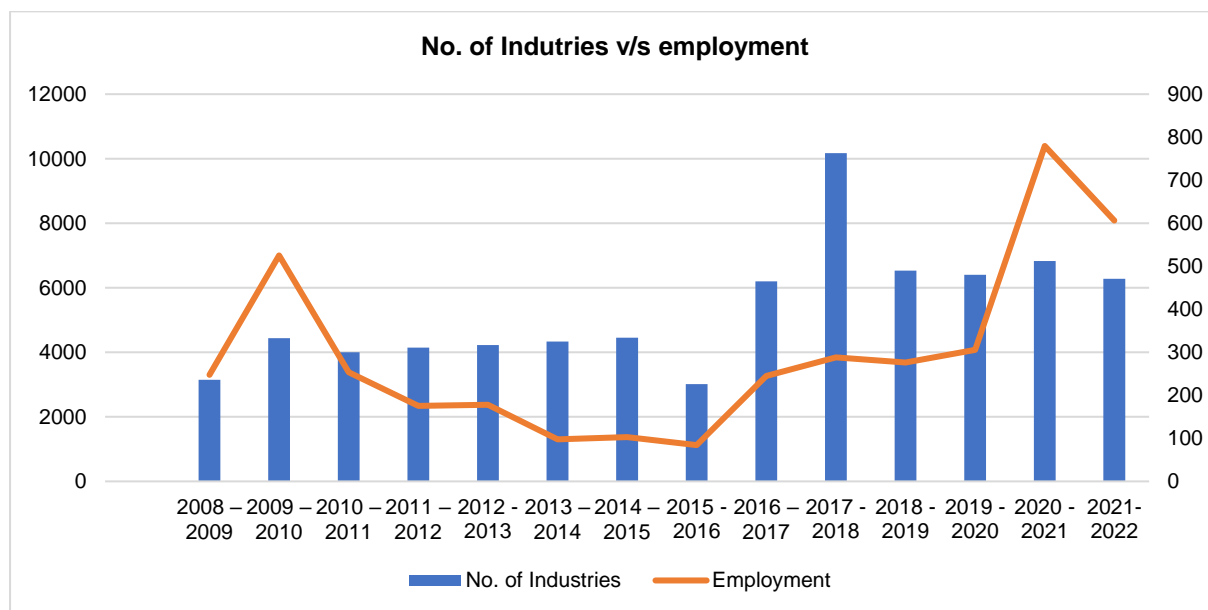
Table 4-5: District Industrial Profile of Dehradun

Secondary Sector	No of Industries (2020- 21)	Investment in cr. (2020- 21)	Employment Generated (2020- 21)
Micro	471	3120.18	8045
Small	0	0.00	0.00
Medium	0	0.00	0.00

Source: Directorate of Industries, Dehradun

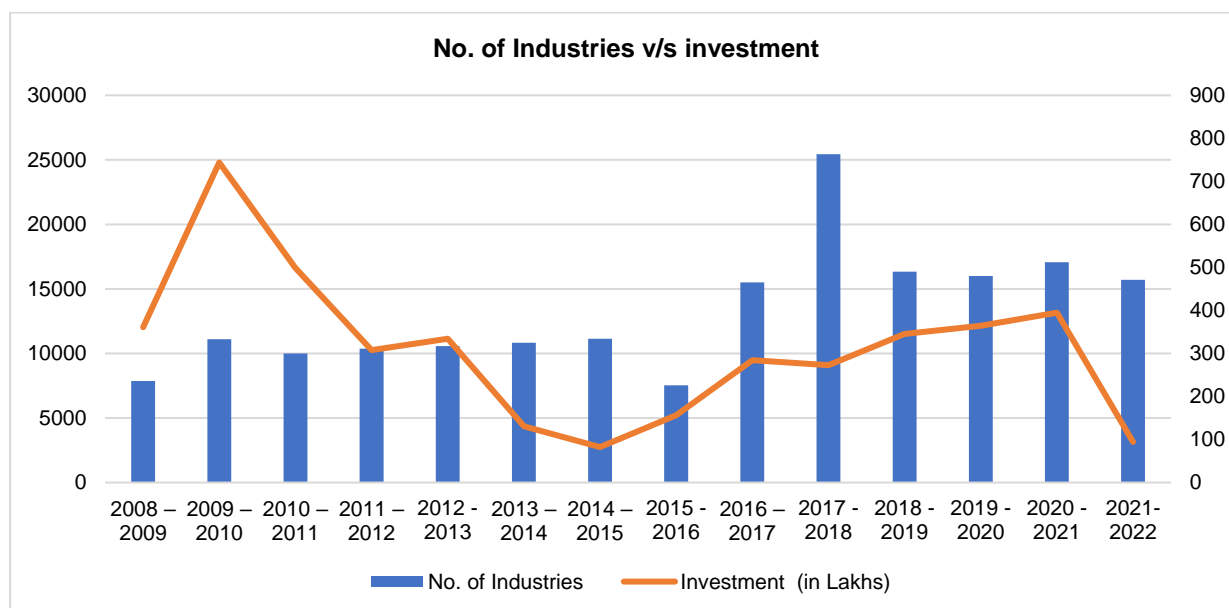
There are currently 471 micro industries available in the Dehradun District. There are 320 service sector industries and 151 manufacturing industries among them. These industries have generated approximately 8000 jobs in total. The investment is expected to be around 3000 crores in 2020-21. When we compare the details over time, we can see that the number of units has increased while investments and job creation have decreased.

Graph 4-2: No. of Industries v/s employment generation in MSME



Source: Directorate of Industries, Dehradun

Graph 4-3: No. of Industries v/s investment in MSME

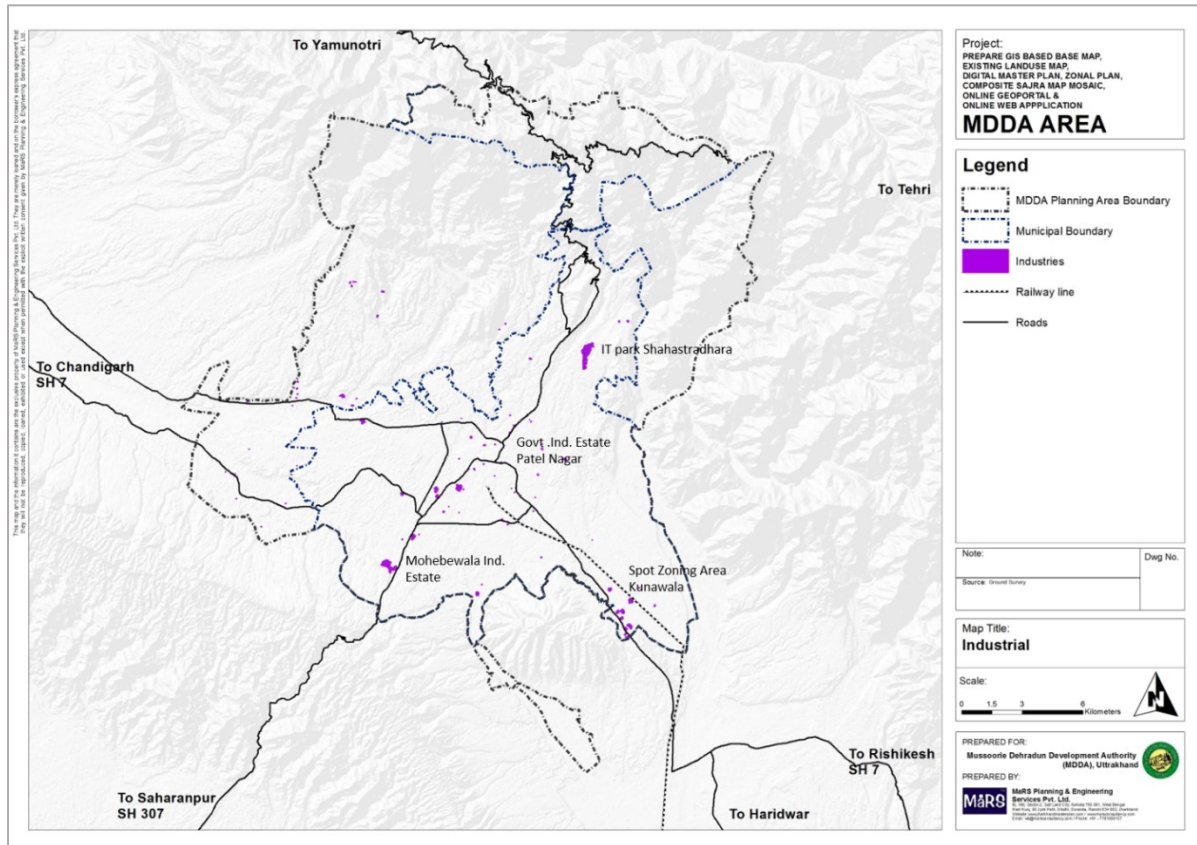


Source: Directorate of Industries, Dehradun

4.6.4 Software technology parks of India (STPI)

STPI was established in year 2001, has its presence in two locations in Dehradun viz. Survey Chowk, near Vikas Bhawan and IT Park Shahastradhara Road.

Map 4-1: Location of Industrial Areas



Source: Doon Ghati Master Plan

4.7 TERTIARY SECTOR

The tertiary sector of Dehradun covers the activities from commerce to administration, transport services, tourism, institutions, and various business and personal services. The region's vast pool of natural resources adds considerably to its attractiveness as an investment destination, particularly for tourism and institutional establishments. As per the Economic Survey of Uttarakhand State for the year 2016 – 17, the contribution of the tertiary sector of Dehradun district to state GDP is around 24.64%

4.7.1 Banking system

Various public and private banks are available within the Dehradun District with a facility of internet banking, money disposal/ withdrawal as well as loan facilities. As per the details available on Dehradun District Portal, a total number of 33 banks are available within the district. Among them, top available banks are: Allahabad Bank, Axis Bank, Punjab National Bank, State Bank, ICICI Bank, Bank Of Baroda, Union Bank of India, Corporation Bank, Dena Bank and Oriental Bank of Commerce

4.7.2 Finance and investment

Apart from government schemes and subsidies, government has also encouraged involvement of private sector to induce better quality control in tourist infrastructure. Private sector has invested in accommodation and transportation services. Apart from that, Uttarakhand government has started the up-gradation and establishment of air strips. All the tourist information centres of state are to be linked through a computer network supported by satellite linkage to improve database management.

The Tourism Board has been providing a range of options to invest for the private investors. Some of the options are resorts, way-side amenities, amusement park, ropeways, golf-courses, drive-in

theatres, heritage hotels, camping sites, tent-colonies, manufacturing/marketing of equipment of trekking, river-rafting, hand-gliding, angling etc.

4.7.3 Retail Market

The Paltan bazaar, Gandhi Road, Lakhtar Bazar, Indira Marg, Connaught Place are major commercial areas of Dehradun and which attracts the inter and intra city market visitors. The working duration of these commercial areas are from morning 10 to evening to 8. The function of the commercial areas adds up the financial contribution of Dehradun Planning Area.

But the pattern of development into these areas are the major concerns that needs special attention through modification into the building regulations such as:

- Lack of availability of parking spaces into the commercial building results into the off-street parking. Example: DL Road, Arhat Bazaar, Paltan Bazaar ISBT, Premnagar and Rajpur Road etc.
- Inadequate pedestrian moment due to narrower streets and unplanned vender's moment.
- Most of the buildings are outage and unsafe – is a threat to the people who residing in them. Hence, no activities for heritage conservation in Gandhi Road market., Moti Bazar, Hanuman Chownk, D.L. Road Arat Bazar.
- Lack of landscape adds to the unpleasant visual quality of the street for e.g., Astley Hall, Paltan Bazaar, Indira Marg etc.
- Hardly any harmony is found in the facade element of the street
- Lack of necessary amenities like; public toilets, dustbins, drinking water booths.
- No availability of open spaces or natural beauty.

4.7.4 Informal commercial areas

According to Times of India news articles and surveys conducted by the consultant while preparing the Base Map and ELU, informal commercial activities have been observed along the Panditwadi, Rispana, and Shahastradhara Road. In addition, illegal commercial development has been observed near Paltan Bazar, Lakhtar Bazar, and Arhat Bazar. conducted (Source: “27 Vending zones to be developed in a city”. Times of India, Jul 20, 2017,22:19 IST)

4.7.5 Street Vendors and Hawkers

Under Pradhan Mantri Street Vendors Atma Nirbhar Nidhi Scheme, Municipal Corporation will conduct a survey to check the status of street vendors who had returned to their villages during the lockdown. Under this scheme, the vendors will receive a loan up to Rs.10,000 for their livelihood.

4.7.6 Vending Zones under NULM scheme

Around 27 locations have been identified where modern vendor's zones in the city will be developed under National Urban Livelihood Mission. These vendor zones will be constructed in locations like Indra Nagar, Race Course, Vasant Vihar, Rajpur Road, Parade Ground, Patel Nagar, Raipur Road, Dharmapuri and Deep Nagar Areas. As per the latest article published by Times of India, around 3000 street vendors are in the city. Among them, a survey of 1758 vendors have already conducted (Source: “27 Vending zones to be developed in a city”. Times of India, Jul 20, 2017,22:19 IST)

Figure 4-1: Retail market in Dehradun Planning area



Rajpur Road



Gandhi Road Market



Niranjn Pur Sabji Mandi



Astley Hall



Paltan Bazaar



Mall Road



Indira Marg



Connaught Place



Landour Bazaar



Tibetan Market



Arhat Bazaar



Sister Bazaar

4.8 SECTOR FOCUSED GOVERNMENT POLICY

To boost the growth prospects of tertiary sector and to promote development of the wider economy, various policies and schemes has been implemented in Dehradun district those are given below:

- Veer Chandra Singh Garhwali Paryatan Swarozgar Yojana, 2011

Veer Chandra Singh Garhwali scheme aims to provide self-employment to the natives of the state, especially the youth. Scheme will be helpful in development of infrastructure and transport facilities development. Permanent resident of the state can apply under this scheme.

- Deendayal Upadhyaya Griha Awas (Home Stay Scheme), 2018

Deen Dayal Upadhyaya Griha Awaas Vikas Yojana has been created to attract tourists to far-flung tourist destinations along with the popular ones, enhance accommodation facilities at local level, generate employment for native people and provide an additional source of income to house owners.

- Rural Tourism Policy

There is an increasing trend of 'experiential tourism' to know new things and experience cultures, cuisine, traditions, etc. Rural tourism exhibiting the unique experiences of Uttarakhand villages and closely related niche areas of tourism such as eco-tourism, farm-tourism, adventure tourism etc. that ultimately helps to boost the economy.

- Uttarakhand Tourism Policy, 2018

The main vision after the policy is to create Uttarakhand as a global tourist destination that is safe, sustainable and which includes world class tourism products and services and could unleash true tourism potential of the State.

4.9 ARTS AND CRAFTS

The city's skilled artisans' exemplary craftsmanship can be seen in the form of magnificent paintings, wood carvings, Aipan folk art, premium jewelry pieces, and much more. These handcrafted items are a perfect representation of the city's diverse ethnic traditions.

Figure 4-2 : Art and Craft in Dehradun



Source: Web Portal, Pinterest

4.10 TOURISM AND HOSPITALITY SECTOR

4.10.1 Hotel industry

According to the Uttarakhand Tourism Department, Dehradun has 805 registered accommodation units, including 140 home stays, 663 hotels/resorts/guest houses, and 2 government guest houses. During peak season, tourists prefer to stay in Dehradun because the city has other major tourist attractions such as Shahastradhara, Robbers Cave, Tiger's Fall, and so on. Another reason Mussoorie hotels are more expensive than Dehradun hotels is that Mussoorie Road has a high traffic volume during peak season, causing traffic congestion.

4.10.2 Adventure sports

In Uttarakhand, Adventure tourism includes activities like Bungee Jumping, Jungle Safari, Mountain Biking, Paragliding, River Rafting, Skiing, Stargazing, Trekking and Water Sports. The study area does not cover much places of Eco and Adventure tourism; hence such activities must be promoted within Dehradun.

4.11 PROMOTION OF INVESTMENT

Investment promotion actively seeks to bring investment opportunities to the attention of potential investors, provides capital, jobs, skills, technology and exports, and increases productivity, innovation and wages in a city or country. Investment promotion is targeted to both domestic as well as foreign companies.

The peaceful environment with high mountain ranges and leisure activities has enticed many investors to purchase weekend homes or second homes. The expansion of the tourism industry has fueled commercial and residential development in Dehradun. Construction of 5-star hotels, shopping malls, and recreational facilities is currently underway. As a result of these factors, it is one of the preferred destinations for NRI real estate investment. Increased investment has enticed several developers, particularly premier builders in Delhi, to propose large projects. Apart from

being an educational hub and state capital, Dehradun's constant population growth has aided infrastructure development.

4.12 EMPLOYMENT SCENARIO

In Master Plan 2041 of Dehradun Planning area, focused has been provided to enhance employment opportunities in the secondary sector to reduce the dependency on tourism and aligned activities.

4.12.1 Main and Marginal labours

As per census 2011, out of total working population, around 90% workers are the main workers while only 10% workers are the marginal workers which has been seen in the wards where availability of the slum pockets is high. Proportion of marginal workers may be reduced by generating employment opportunities in the secondary sectors where workers may able to get a regular job.

4.12.2 Jobs in Secondary sectors

Currently, micro industries of manufacturing and service sectors are available within the Dehradun District that provides employment opportunities to its citizens. But, the investment and employment in this sector has been reducing since last few years. For reducing the dependency on the tertiary sector and increasing the share of regular jobs, employment opportunities in secondary sector needs to be generated through proper investment and identification of other potential industrial sectors.

4.12.3 Employment in the tertiary sector

Scope of employment generation through tourism is enormous in the hospitality industry including, as tour operators and guides, the transport sector, local restaurants/ Dhaba's, etc. There are various policies at state level which aims to provide employment through tourism activities such as:

- Veer Chandra Singh Garhwali Paryatan Swarozgar Yojana

Veer Chandra Singh Garhwali scheme aims to provide self-employment to the natives of the state, especially the youth. Scheme will be helpful in development of infrastructure and transport facilities development. Permanent resident of the state can apply under this scheme.

- Deendayal Upadhyaya Griha Awaas (Home Stay Scheme)

Deen Dayal Upadhyaya Griha Awaas Vikas Yojana has been created to attract tourists to far-flung tourist destinations along with the popular ones, enhance accommodation facilities at local level, generate employment for native people and provide an additional source of income to house owners.

4.13 SECTOR FOCUSED GOVERNMENT SCHEMES AND POLICIES

Based on the census data analysis and review of sector wise various proposals those are already in pipeline, the workforce for the year of 2041 has been projected. The total workforce for the plan period would be 7,77,922. Among them 11,669 will be engaged in primary sector, 77,792 will be engaged in secondary sector and 6,88,461 will be engaged in tertiary sector.

4.13.1 Agriculture Policy 2011

The Uttarakhand government has approved a new agriculture policy in 2011 for providing necessary infrastructure, generation of employment and forming special agriculture zones as a pilot project. The Uttarakhand agriculture and horticulture departments are implementing SAZ as a pilot project in Raipur block of Dehradun.

4.13.2 PM Employment Generation Program

For employment generation, Uttarakhand Government is providing funds to entrepreneurs to start employment-generating projects under PM Employment Generation Program (PMEGP) which

aims to generate jobs in both rural and urban regions by way of self – employment ventures and micro enterprise. Moreover, for reducing migration from rural areas to urban areas, various schemes/ act/ policies have been launched by central and state government such as:

- Mahatma Gandhi National Rural Employment Guarantee Act (MGNREGA)

The main objective of this act is to enhance livelihood security in rural areas by providing at least 100 days of guaranteed wage employment in a financial year, to every household whose adult members volunteer to do unskilled manual work.

- Deen Dayal Upadhyaya Grameen Kaushalya Yojana (DDUGKY)

It aims to skill rural youth who are poor and provide them with jobs having regular monthly wages or above the minimum wages. It is one of the cluster of initiatives of the Ministry of Rural Development, Government of India that seeks to promote rural livelihoods.

- Shyama Prasad Mukherji Rurban Mission (NRuM)

The main vision of the mission is to develop a cluster of villages that preserve and nurture the essence of rural community life with focus on equity and inclusiveness without compromising with the facilities perceived to be essentially urban in nature, thus creating a cluster of "Rurban Villages".

- Rural Business Incubator

Rural Business Incubator (RBI) is a collaborative programme designed to help the youths with innovative business ideas, new startups, nano enterprises to succeed in their business goals.

- Vidhayak Nidhi

The government had introduced MLAs Local Area Development Scheme from 2000-01 making MLAs able to recommend small development works. Under the scheme, each MLA has the choice to suggest to the Chief Development Officer of his/her district, to the extent of allocations given from year to year, to be taken up his/her constituency. At present, the State Government is allocating Rs 3.75 crore per annum as MLA funds each year.

4.13.3 Training for skill development for Employment

In order to address the challenges of unemployment and ensuring gainful and sustainable employment to the youth of the state, Hon'ble Chief Minister has created Uttarakhand Skill Development Mission (UKSDM) in February 2013. The state plan to train 6.5 lakh youth and provide employment.

4.14 PROVISION OF ALTERNATIVE ECONOMIC OPPORTUNITIES

Some of the potential industrial sectors that may work as an alternative economic opportunity in Dehradun are given below:

1. **Handicrafts, Handloom, Wool Based Industry, Khadi and Village Industries** - The region is host to several handicrafts industries such as carpet weaving, woodcarving, brassware and copper-based industries. The state plans to tap the potential of these skill-rich industries by way of infrastructure support, training, design development, new techniques, packing, marketing events and exhibitions.

Wool and wax-based industry and khadi and village industries are some of the key traditional industries operating in the state. While the wax-based industry is an important handicraft industry in the hilly areas of the state, large section of the population in the state is associated with the wool-based industry. The State has assigned due priority to develop these industries to their optimum potential.

2. **Biotechnology** - The state will accord the units coming under this sector with the industry status and aims to establish an internationally competitive business infrastructure and environment for the industry in the state. Further, a biotechnology park is to be developed that

will integrate resources and provide a focused institutional set up for accelerated commercial growth of bio-technology and bio-informatics. The Government is also in the process of creating an Exchange Zone for Medicinal and Aromatic Plants to serve as a common platform for research institutions, technology developers and producers.

3. **Enhancement of Agro and Food Processing Industry** - The State Government is also providing matching subsidy for projects under various schemes of Agricultural and Processed Food Products Export Development Authority (APEDA), National Horticulture Board (NHB), Ministry of Food Processing Industry (MFPI) and the Natural Medicinal Plant Board (NMPB)

4.15 FUTURE PROSPECTS

For increasing tourism and economic opportunities along with planned development, central government has proposed some of the infrastructure projects such as:

1. Delhi-Dehradun Economic Corridor
2. Dehradun-Paunta Sahib (Himachal Pradesh) road project
3. Perfumery and Aroma Laboratory (Centre for Aromatic Plants)
4. Dehradun Mussoorie Ropeway Project
5. Intra city metro corridors - Dehradun
6. Inter City Metro Corridors – Connecting Dehradun, Rishikesh and Haridwar

4.16 WORKFORCE PROJECTIONS

As per census 2011, WFPR of Dehradun (M. Corp+OG + OG) is 33.93%. Based on the observations of census data and review of proposals those are in pipelines, some assumptions have been made those are mentioned into the table given below:

Table 4-6: Sector Wise Workforce Distribution

Year	2021*	2031*	2041*
Total Population (No.)	11,65,712	15,44,798	20,47,162
WFPR (%)	35.00	37.00	38.00
Total Working Population (No.)	4,07,999	5,71,575	7,77,922

Note: Estimations are for the Residential Population of Dehradun Town

4.16.1 Sector-wise Projected Workforce

As per Census 2011, share of primary, secondary and tertiary sector workers in Dehradun city is 2.04%, 4.49% and 93.47% respectively. Based on the observation of Census data and review of proposals those are in pipelines, some assumptions have been made those are mentioned into the table given below:

Table 4-7: Sector wise workforce projection for Dehradun City

Year	2021*	2031*	2041*
Total Working Population (No.)	4,07,999	5,71,575	7,77,922
Share of Primary Sector Workers (%)	2	1.75	1.5
Population Working in Primary Sector (No.)	8,160	10,003	11,669
Share of Secondary Sector Workers	6	8	10
Population Working in Secondary Sector (No.)	24,480	45,726	77,792
Share of Tertiary Sector Workers	92	90	89
Population Working in Tertiary Sector (No.)	3,75,359	5,15,847	6,88,461

Note: Estimations are for the Residential Population of Dehradun Town

4.17 COMMERCIAL AREAS DEMAND

A five tiers system of commercial areas is envisaged to accommodate required shopping, commercial office and other service activities like cinema, hotel and restaurant and various community services and facilities in an integrated manner.

Table 4-8: Commercial Area Demand

Category	Population Served per unit	Existing Facilities (No.)	Additional requirement (No.)	Future Land requirement (Ha)
City Centre/ Sub City Centre	25,00,000	1	-	-
District Centre	5,00,000	2	2	93
Community Centre	1,00,000	9	12	7558
Local shopping including service Centre	15,000	59	78	35
Convenience Shopping	5,000	176	234	35
Total		246	352	222

4.18 INDUSTRIAL AREAS DEMAND

For the area requirement of industrial zone following assumptions are considered:

7. For area requirement by 2041, 100 workers per hectare is taken as per URDPFI Standards
8. Secondary workers by 2041 is around 77,792 (10% of the total working population)

Additional area requirement for the industries will be around **777.92 ha**.

5 HOUSING AND SLUM

5.1 INTRODUCTION

The existing housing characteristics, slum conditions, and housing needs in the Dehradun Planning Area are described in this chapter. As stated in the demography chapter, the city's population is growing as a result of migration and tourism. Because the city is a hub for national educational institutes, a large number of students live in the city for a limited time. As a result, major housing requirements fall into two categories: permanent housing and rental housing. As the city attracts more people, the city's land distribution suffers, resulting in a housing shortage in city.

5.2 EXISTING HOUSING STOCK

According to the 2011 Census, the total number of households is 2,07,245 in Dehradun Planning Area. The average HH Size is around 4.5 Person/HH. In the Cantonment Board Area, there are 15,919 households, with an average HH size of 4.7 person per HH. However, as in any other city, the housing system through real estate developer does not have a sufficient provision of EWS & LIG Housing and lacks facilities such as open spaces, schools.

As per the HH Survey Analysis, maximum households are having either 2 or 3 dwelling rooms and maximum buildings in Dehradun Area is either 2 or 3 stories. Concrete, Tin and Brick are used as a construction material. As far as the typology of housing is concerned, maximum houses are detached, semidetached or row houses. As far as the ownership are concerned, around 22% of the household's lived into the rented properties. Details of Housing Condition, No. of Dwelling Rooms and Ownership Status are discussed in detail in the tables given below.

Table 5-1: Housing Condition in planning area

Housing Condition (%)			
Category	Good	Liveable	Dilapidated
Dehradun (M+ OG)	79	19	3
Cantonment Board	78	21	1
Villages	76	21	3

Source: Housing Census 2011

Similarly, 78% of the total houses in the Cantonment Board area are in good condition, 21% are habitable, and 1% are dilapidated. So, in the MMDA Area, the majority of houses are in good condition, and only a small percentage of houses are unfit to live in, whereas in rural areas, the majority of houses are in good condition, and only 3% are in dilapidated condition.

Table 5-2: Details of No. of dwelling rooms in Dehradun Planning Area

No. of Dwelling Rooms (%)					
Category	One	Two	Three	Four	More than 4
Dehradun (M+ OG)	23	25	23	16	12
Cantonment Board	20	31	25	15	9
Villages	21	27	23	16	12

Source: Housing Census 2011

In Dehradun Municipal and outgrowth areas, 25% of the houses have two dwelling rooms, while only 12% houses have more than 4 dwelling rooms, indicating that with a household size of 4.5 pph, most people live in two dwelling rooms in proper ventilation and sunlight. In rural areas majority of the people lives in two dwelling units and only 12% houses have more than 4 dwelling rooms.

5.2.1 Housing Characteristics -Typology

Houses provided under different schemes like Pradhan Mantri Awas Yojna and Rajiv Awas Yojna are as follows:

Table 5-3: Details of No. of dwelling rooms in Dehradun Planning Area

Housing category	Total number	Allotted	Empty
EWS	2267	2242	25
LIG	1175	981	194
MIG	1318	1168	194
HIG	646	349	297
Total	5406	4740	710

Source: Mussoorie Dehradun Development Authority

The total number of houses provided under different categories are 5406 where maximum units are covered under EWS category i.e., 2267 units. Total houses constructed under LIG, MIG and HIG are 1175, 1318 and 646 respectively. Out of the 5406 houses, 4740 has been allotted while 710 units are still empty. HIG houses are emptier as compare to other housing categories.

5.2.2 Type of Housing Structure

As per the census data majority of the houses are permanent houses in a city which refers to those houses whose walls & roofs are made of pucca materials, i.e., where burnt bricks, G.I. Sheets or other metal sheets, stone, cement, concrete is used for wall and tiles, slate, shingle, corrugated iron, zinc or other metal sheets, asbestos sheets, bricks, lime and stone and RBC/RCC concrete are used for roof. Semi-permanent houses refer to those houses made of other types of materials. Temporary houses refer to those houses having wall and roofs made of Kutcha materials, i.e., mud and unburnt bricks are used for the construction of walls and wood etc. are used for roofs.

Table 5-4: Types of housing structures

Types of housing structures						
	Permanen t	Semi- permanent	Total temporary	Serviceable	Non- serviceabl e	Unclassified
%	94.1	4.1	1.3	0.9	0.4	0.5

Source: Housing Census 2011

5.2.3 Ownership Status

The majority of houses in the Dehradun Planning Area are owned by city residents. The percentage of people who own their homes in Dehradun Municipal Area and Cantonment Board is high (71-73%) compared to 22%-23% who rent their homes. In villages, the majority of villagers (84%) own their homes, while only 9% rent their homes.

Table 5-5: Details of Ownership Status in Dehradun Planning Area

Ownership Status (%)			
Category	Own	Rented	Other
Dehradun (M+ OG)	71	22	7
Cantonment Board	73	23	3
Villages	84	9	6

Source: Housing Census 2011

5.2.4 Building Condition(s)

As per census 2011 the overall houses that are good and in habitable conditions constitutes about 78.8% of the total. Whereas houses that are considered liveable and dilapidated are 18.6% and 2.6% respectively. If we look at only the residential buildings those in good conditions are about 78% out of the total 95.9% houses. Where as in the mixed-use areas (residence cum other use which includes houses used for non-residential purposes such as shops, offices, schools, colleges, hotel, lounge, guest house, hospital, dispensary, place of worship, factories etc) houses in good conditions are 2.9% and those in liveable conditions are 1.1%.

Table 5-6: Details of Ownership Status in Dehradun Planning Area

Building conditions within Municipal Corporation and Outgrowth					
Total	%	Residence	%	Residence-cum other use	%
Total	100	Total	95.9	Total	4.1
Good	78.8	Good	75.9	Good	2.9
Liveable	18.6	Liveable	17.5	Liveable	1.1
Dilapidated	2.6	Dilapidated	2.5	Dilapidated	0.1

Source: Housing Census 2011

5.3 AVAILABILITY OF UTILITIES AND SERVICE(S) IN RESIDENTIAL AREAS

5.3.1 Water Supply

Majority of the city's population that is 91.7% has drinking water source within the premises followed by 5.5% having one nearby the premises and only 2.7% population having drinking water source away from where they reside. The main source of drinking water for the city is tap water from treated source as 90.4% population gets access to this source.

Table 5-7: Main source of drinking water

Types of sources	Topwater from treated source	Topwater from un-treated source	Covered well	Un-Covered well	hand pump	tube well	spring	River/canal	Tank/pond/lake	Other sources
%	90.4	3.1	0.1	0	4.1	1.8	0	0	0.1	0.4

Source: Housing Census 2011

5.3.2 Lighting

Table 5-8: Main source of lightning

Main source of lightning						
Types of sources	Electricity	Kerosene	Solar energy	Other oil	Any other	No lightning
%	97.9	1.7	0	0.1	0.2	0.2

Source: Housing Census 2011

5.3.3 Sanitation

Table 5-9: Sanitation facilities in the study area

Sanitation facilities in the study area														
Numb er of house holds havin g latrin e facilit y within the premi ses	Flush/pour flush latrine connected to			Pit latrine		Nigh t soil disp ose d into ope n drai n	Service Latrine		Numb er of house holds not havin g latrine facilit y within the premi ses	Alternati ve source		Number of households having bathing facility within the premises		
	Pip ed sew er syst em	Se ptic tan k	Oth er syst em	With slab/ ventil ated impro ved pit	With out slab/ ope n pit		Night soil remo ved by hum an	Nigh t soil servi ced by ani mal		Pu blic latrine	Op en	Yes		No
												Bath room	Encl osur e with out roof	
97.1	39.3	49.8	1.5	4.8	0.1	1.5	0	0.1	2.9	1.5	1.3	94.2	2.7	3.1

Source: Housing Census 2011

5.3.4 Drainage

Table 5-10: Drainage facility in the city

Waste water outlet connected to		
Closed drainage	Open drainage	No drainage
54.9	37.3	7.9

Source: Housing Census 2011

5.3.5 Cooking Fuel

Table 5-11: Cooking facility in the city

Waste water outlet connected to		
Closed drainage	Open drainage	No drainage
54.9	37.3	7.9

Source: Housing Census 2011

5.3.6 Kitchen Facilities

Table 5-12: Kitchen facilities

Kitchen facility							
Total	Cooking inside house:	Has Kitchen	Does not have kitchen	Cooking outside house:	Has Kitchen	Does not have kitchen	No Cooking
100	98.6	88.9	9.7	1.1	0.5	0.6	0.3

Source: Housing Census 2011

5.4 HOUSEHOLD SURVEY ANALYSIS

The household surveys of 21,349 Households were carried out which was 10% of 2,13,490 HH of MDDA. The household survey included detailed questions about Family member details with age-sex composition, Size of Family, Travel Mode, Family Finance, Assets owned, Expenditure Details,

savings, Housing Details- size, floors, Ownership status, No. of room, material used, Facilities etc. the questionnaire also included questions related to physical infrastructure and social infrastructure such as Water Supply, Sanitation, Solid waste, Roads & Transportation, Electricity, Educational Facilities and Health Facilities.

Table 5-13: Sampling of household surveys

S.No.	Description	Total Population	Household	Sample household
1	Dehradun (M.Corp+OG + OG)	574840	125237	12523
2	Mussoorie (MB)	30118	6245	624
3	Dehradun (CB)	52716	11230	1123
4	Clement Town (CB)	22557	4689	468
5	Raipur (CT)	32900	7471	747
6	Natthan Pur (CT)	13905	3221	322
7	Mehu Wala Mafi (CT)	13475	2474	247
8	Natthuwa Wala (CT)	9206	1903	190
9	Additional Villages	240934	50986	5098
	TOTAL	990651	213490	21349

Source: Consultant's Survey

Random Stratified sampling method is used for the house hold survey, each zone is taken into consideration in process of selection of households

Figure 5-1: Surveyors taking surveys of locals



According to the results of the above surveys, the majority of the population is between the ages of 16 and 35. More than 80% of households earn more than Rs 25,000 per month, and the majority of the working population is in the tertiary sector, which includes business, trade, and jobs. It was also discovered that the ratio of girls is higher in the 6-25 age group, while the ratio of males is higher in the 26-35 age group.

5.5 HOUSING POLICY OF STATE AND CENTRE (L)

5.5.1 National Urban Housing and Habitat Policy 2017

The National Urban Housing & Habitat Policy 2007 (NUHHP-2007) was developed with the changing socioeconomic parameters of urban areas in mind, as well as the growing demand for shelter and related infrastructure. The Policy aims to encourage various types of public-private partnerships in order to achieve the goal of "Affordable Housing for All," with a focus on the urban poor. Given the magnitude of the housing shortage and the Central and State Governments' budgetary constraints, the NUHHP-2007 focuses on multiple stakeholders, namely the Private

Sector, the Cooperative Sector, the Industrial Sector for labour housing, and the Services/Institutional Sector for employee housing.

5.5.2 Pradhan Mantri Awas Yojna (PMAY)

The Mission runs from 2015 to 2022 and provides central assistance to Urban Local Bodies (ULBs) and other implementing agencies via States/UTs. The following four components of the Pradhan Mantri Awas Yojana provide benefits to eligible candidates: 1. In-Situ Slum Redevelopment Scheme (ISSR) 2. Credit Linked Subsidy Scheme (CLSS) 3. The Affordable Housing Partnership (AHP) Program Beneficiary-led Individual House Construction Scheme (BLCs). According to PMAY(U) guidelines, the size of a house for the Economically Weaker Section (EWS) could be up to 30 sq. mt. carpet area; however, States/UTs have the flexibility to increase the size of houses with the Ministry's consultation and approval.

The Uttarakhand government developed the Housing Policy 2017 to meet the goal of providing housing to the most vulnerable members of society under the Pradhan Mantri Awas Yojna.

1. Model 1: Normal Group Housing: By Private developer on private land
2. Model 2: Complete Affordable Housing: By Private developer on private land
3. Model 3: Part Affordable Housing: By Private developer on private land
4. Model 4: Affordable Housing: By private developer or by Government Organization on Government land
5. Model 5: Affordable Housing: For Govt. Organization (Development Authority, Local Bodies, Parastatal Organizations)

5.5.3 Uttarakhand Housing Policy

Uttarakhand Housing Policy was established in 2017 and modified in 2018. The purpose of the policy is

- To encourage planned development in the housing sector.
- Effective use of land to provide safe housing.
- Formulate guidelines to encourage public-private partnership in housing sector.
- To prepare an effective mechanism for encroachment, rehabilitation and in situ development to meet the target of slum-free cities.
- Reconstruction and resettlement in core urban areas and facilitating dilapidated buildings through land acquisition options, reconsolidation and quitable land acquisition process
- To facilitate the construction of affordable housing in the state
- To provide housing to the economically weaker section and low-income group considering the housing provided under Pradhan Mantri Awas Yojna.

A minimum of 10% of the area in the Zonal Plan/Master Plan will be reserved for EWS/LIG houses under this scheme. In new residential colonies, it is mandatory to provide 15% residential units or 25% FAR to the EWS category. To prevent abuse, the ownership rights granted to the urban poor will be non-transferable for 10-15 years from the date of allotment. On flat terrain, the minimum area to be reserved for affordable housing is 4000 square metres, and on hilly terrain, the minimum area to be reserved is 2000 square metres, with a FAR of 2 metres. This scheme will build 100% affordable houses, with at least 45% of the FAR reserved for the EWS and LIG categories (35% for EWS and 10% for LIG).

5.6 EXISTING SLUM SCENARIO

Around 1.57 lakh population (around 30,500 HH's) lives in the slums area which is around 20% percent of the total urban population. Around 118 slums are identified in the Urban area which covers the area of around 1.82 sq. km. Out of 118 slum pockets, 105 pockets are notified and 13 are non notified. Their details are described in the figure given below:

Out of 118 slums, 78 slum pockets are identified on public lands while 40 slums were identified on the private land. Apart from that, around 60% slums are located along the water bodies while 26% are along the major transport corridors and rest of the others are nearer to the industries.

Majority of the landuse along the slums are residential making a very less presence of other important landuses such as commercial & PSP.

Slums along Rispenna River are highly dense and the houses are very close to each other with no margins or setbacks, which is unsafe for a resident in Dehradun as it is an earthquake prone area. Also the roads & streets are very narrow for vehicles to pass, which may create problem for evacuation during the time of any emergency. Also, it creates a life threat for the residents during rainy season if the river overflows.

Same situation is also observed at the Bindal River.

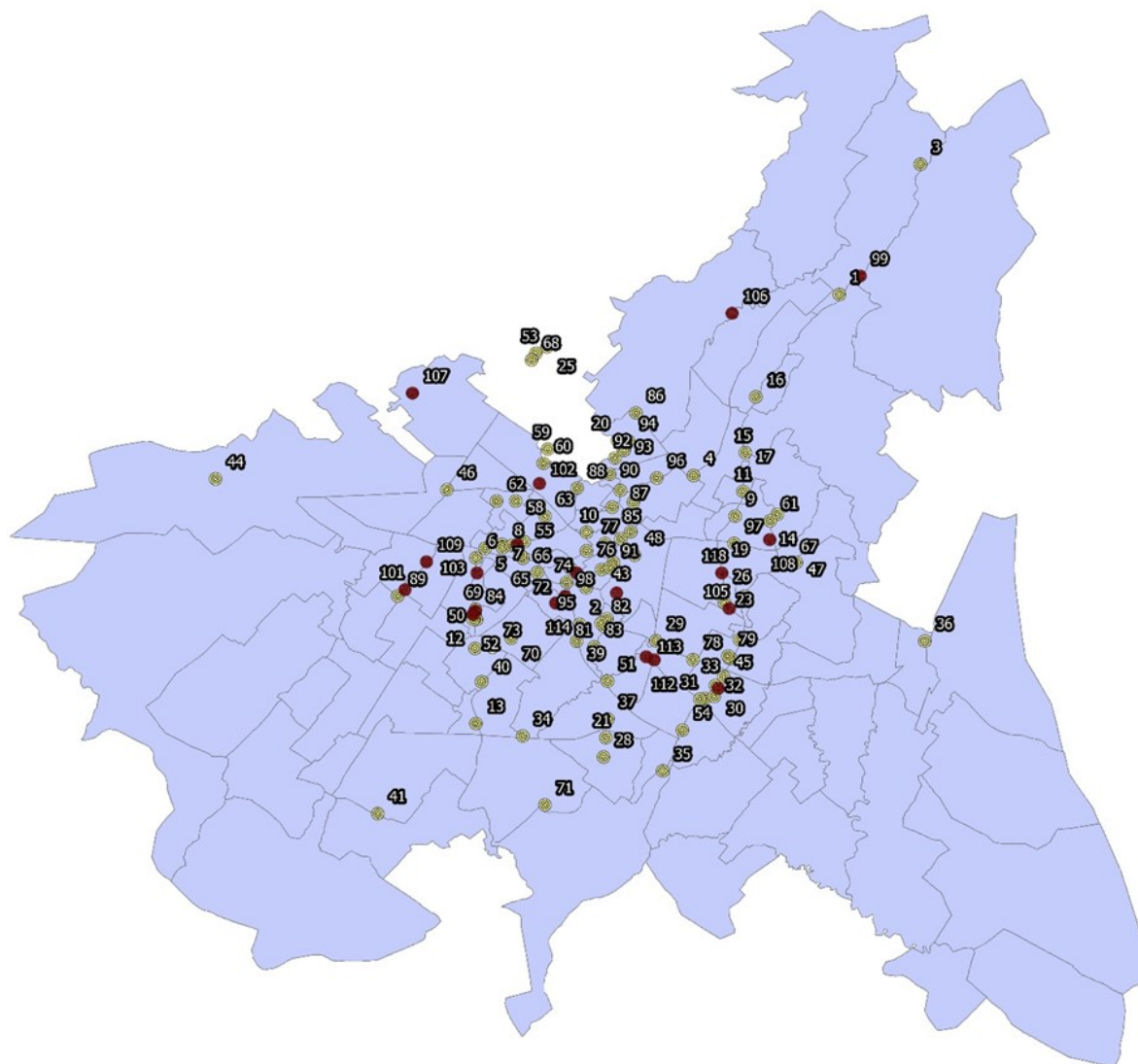
As we can see from the figure given below, higher concentration of slums is observed in the core city area. covering the wards of 11, 24, 26, 27, 29, 44, 50, 57, 74, 80.

Figure 5-2: Details of Slums



- | | | |
|---------------------------------------|------------------------------------|--------------------------------|
| 1. ABDUL HAMEED NAGAR | 41. INDRA COLONY | 80. RAJIV NAGAR PARTIIDANDA |
| 2. ADHOIWALA ROAD | 42. INDRESH NAGAR | 81. AJABPUR |
| 3. AHIR MANDI | 43. JATIYA MOHALLA | 82. RAJIV NAGARI |
| 4. AMBEDKAR COLONY D L ROAD | 44. JAWAHAR COLONY | 83. RAJIV NAGARII |
| 5. ANANDGRAM ADHOIWALA | 45. KABRISTAN MALIN BASTI | 84. RISHI NAGAR ADHOIWALA |
| 6. ARYA NAGAR BASTI | 46. KANWALI ROAD BHATTA BASTI | 85. RISPANA KHATIK MOHALLA |
| 7. AZAD NAGAR RAJPURI ROAD | 47. KATH BANGLA | 86. RISPANA NAGAR |
| 8. BADRINATH COLONY | 48. KATH BANGLA 02 | 87. SAIYYAD MOHALLA NORTH |
| 9. BALBIR ROAD | 49. KISHAN NAGAR | 88. SAMPERA BASTI |
| 10. BALMIKI BASTI | 50. KUMAR MANDI EIDGAH | 89. SANJAY BASTI |
| 11. BALMIKI BASTI SALWALA | 51. LAKHKHI BAGH | 90. SANJAY COLONY MOHINI ROAD |
| 12. BANGHAT | 52. LOHARWALA | 91. SATI COLONY |
| 13. BANJARAWALA | 53. LOHIA NAGAR | 92. SHANTI VIHAR |
| 14. BHAGAT SINGH COLONY | 54. LONIA MOHALLA | 93. SHARMA COLONY |
| 15. BRAHAMNWALA | 55. MACHCHI TALAB | 94. SHASHTRI NAGAR |
| 16. BRAHAMNPURI | 56. MADHU VIHAR | 95. SHASHTRI NAGAR CHUNA |
| 17. BRAHMANWALA LOWER | 57. MADRASSI COLONY | 96. BHATTA |
| 18. BRIJLOK COLONY | 58. MAHBOOB COLONY | 97. SHEETLA VIHAR |
| 19. CHABILBAGH | 59. MELA RAM COLONY | 98. SHIVLOK |
| 20. CHAMANPURI | 60. MUSLIM BASTI KASAI MOHALLA | 99. SHIVLOK AJABPUR |
| 21. CHANDRA NAGAR BALMIKI BASTI | 61. MUSLIM COLONY | 100. SHIVNAGAR |
| 22. CHANDRA ROAD | 62. NAGAL | 101. SHIVPURI |
| 23. CHANDRA SHEKHAR AZAD COLONY | 63. NAI BASTI DHARAMPUR RAISCOURSE | 102. SHIVPURI COLONY |
| 24. CHANDRALOK RAJPUR | 64. DAKSHIN | 103. SINGHAL MANDI |
| 25. CHETNA BASTI | 65. NAI BASTI GHASS MANDI | 104. SONIA BASTI |
| 26. CHUKKHUWALA KHATIK MOHALLA | 66. BHAG2RAJPUR | 105. SUMAN NAGAR |
| 27. CHUKHUWALA NAI BASTI | 67. NALA PANI ROAD | 106. SUMAN NAGAR GHASS MANDI |
| 28. DANGWAL MARG | 68. NEELOWALI TURNER ROAD | 107. SUMANPURI MALIN BASTI |
| 29. DEEP NAGAR | 69. NEW KHUDBUDA | 108. THANO GAON MALIN BASTI |
| 30. DEVRISHI COLONY | 70. NEW PATEL NAGAR | 109. UTTARAKHAND VIHAR |
| 31. DHARAMPUR SUMAN NAGAR MALIN BASTI | 71. NIMMI ROAD | 110. VALMIKI BASTI |
| 32. MATA MANDIR | 72. PANCHPURI CHANDER ROAD | 111. VANI VIHAR |
| 33. DIVYA VIHAR | 73. PARSOLIWALA | 112. VIJAY COLONY |
| 34. EAST PATEL NAGAR | 74. PATHARIA PEED I | 113. VIJAY NAGAR |
| 35. GADLOK MALIN BASTI | 75. PATHARIA PEED II | 114. VIR GABBAR SINGH BASTIIII |
| 36. GANDHI BASTI | 76. PATHARIA PEED III | 115. VIR GABBAR SINGH COLONY |
| 37. GANDHI GRAM | 77. PURAN BASTI | 116. VIRGIRWALI |
| 38. GANDHI GRAM GMS ROAD | 78. RAISCOURSE ABLOCK | 117. VIVEK VIHAR PHASEI |
| 39. GANDHI NAGAR CHAKRATA ROAD | 79. RAISCOURSE BBLOCK | 118. VIVEK VIHAR PHASEII |
| 40. GHASS MANDI | 80. RAISCOURSE CBLOCK | |
| 41. GOVIND GARH | 81. RAJIV NAGAR KANDOLI | |

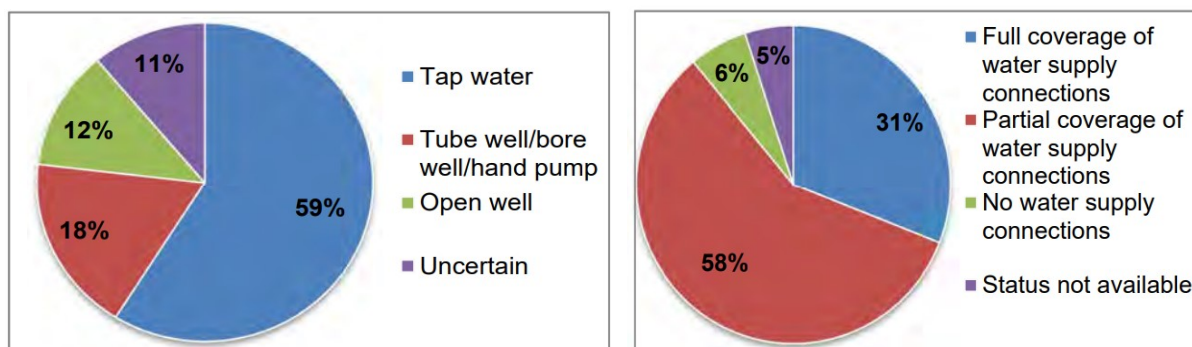
Map 5-1: Location of Slums



5.6.1 Availability of Basic Services in Slum

5.6.1.1 Water supply:

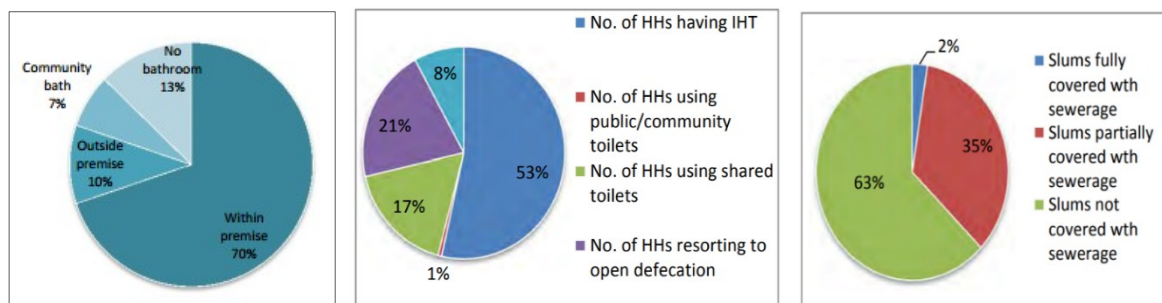
Graph 5-1: Water Supply in Slum areas



According to surveys conducted for Dehradun Nagar Nigam under the Rajiv Awas Yojna, 59% of slums have tapped water, 18% have water via tube well/bore well/hand pump, and 12% rely on open wells. In Dehradun, 31% of slums have full coverage water supply connection, 58% have partial coverage, 6% do not have water supply connection, and the status of 5% slums is unspecified.

5.6.1.2 Sanitation and Sewerage:

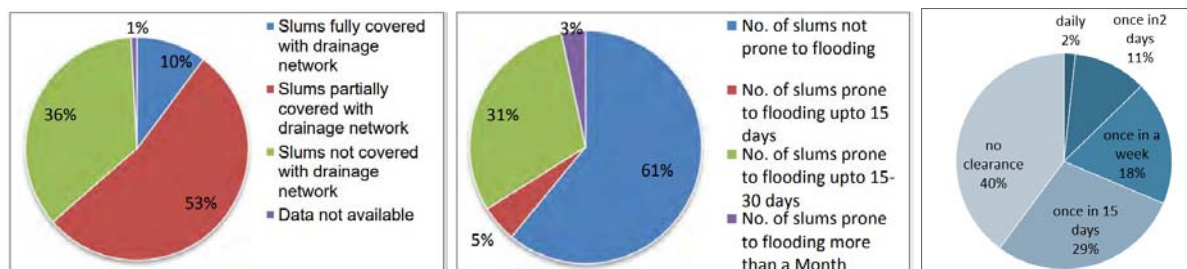
Graph 5-2: Coverage of Sewerage, Access to Bathroom and Toilets in Slums



Out of total 127 slums in Dehradun, 70% slum dwellers have bathroom available within their premises, 10% have outside the premise, 7% use community bath while 13% does not even have the toilet facility. In slums, only 2% have fully covered sewerage connection, 35% have partial sewerage connection while majority of the slums i.e., 63% does not have sewerage connection. 53% of the slums have Individual household toilets, 17% use shared toilets, 21% open defecate and only 1% use public toilet/community toilet. Open defecation is very common in slum areas like Balmiki Basti, Shivlok Ajabpur, Indira Colony, Azad Nagar, etc. where "pay and use" public toilets are not provided, maintained badly or not functional. There are in total 77 community/public toilets in Dehradun from which very few are accessible to the slum dwellers leading to open defecation.

5.6.1.3 Drainage Network

Graph 5-3: Coverage of Storm Water Drains, Slums prone to floods and drain clearance

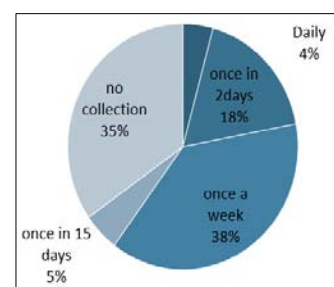


In slum areas, only 10% have fully covered drainage network, 53% have partial network whereas 36% does not have drainage network at all and for 1% slum data is not available. Most of the slums are prone to floods during monsoon as they are located in the low-lying areas along rivers or streams. The existing drains are also not efficient enough to drain the surface run off as they get clogged because of dumping of solid wastes. As per Rajiv Awas Yojna, 39% slums get flooded during monsoon out of which 31% are prone to flood for the period of 15-30 days, 5% for 15 days while 3% remains flooded for a month. In slums 60% drains get cleared where only 2% of the drains get cleared daily, 11% drains once in 2 days, 18% get once in a week and 29% once in 15 days.

5.6.1.4 Waste Management

In Dehradun, Waste management is observed to be insufficient as 35% of the slums does not have waste collection facility. Out of the total slums in the city, 75% slum area's waste is collected where only for 4% slums it gets collected daily while for 18% it happens once in 2 days, for 38% slums it gets collected once in a week and once in 15 days for 5% slums. The areas where waste is not collected results into dumping of waste directly in the river or drains.

Graph 5-4: Coverage of Storm Water Drains



5.7 CONCEPT OF CITY WITHOUT SLUM

5.7.1 Slum Free City Action Plan

The vision of the plan is to provide Housing for All by 2022 when the Nation completes 75 years of its Independence. In order to achieve this objective, Central Government has launched a comprehensive mission "Housing for All by 2022". The mission seeks to address the housing requirement of urban poor including slum dwellers through following programme verticals:

- Slum rehabilitation of Slum Dwellers with participation of private developers using land as a resource
- Promotion of Affordable Housing for weaker section through credit linked subsidy
- Affordable Housing in Partnership with Public & Private sectors
- Subsidy for beneficiary-led individual house construction

MDDA has been taking up annual targets of providing affordable houses to citizens of Dehradun. Other than this, Dehradun Municipal Corporation is preparing "housing for all plan of action" (HFAPoA) for providing houses to Urban Poor & slum dwellers which form 26% of Dehradun's population. As of now, 18954 Dwelling units covered under PMAY scheme.

5.7.2 Slum Upgradation

Informal settlements in Dehradun need to be improved and eventually incorporated into the city itself, through the provision of secured land tenure, social services (such as water, sanitation, and electricity), and citizenship to slum dwellers under the Uttarakhand Slum Regularization and

Rehabilitation Act (Slum Act, 2016), Housing, streets, footpaths, drainage, clean water, sanitation, and sewage disposal are common components of the process. In addition to basic services, one of the key elements of slum upgrading is legalising or regularising properties and bringing secure land tenure to residents.

5.7.3 Slum Relocation

Relocation/resettlement of slum dwellers from existing slums to an alternative site, including the provision of living space as well as basic civic and infrastructural services. There are a few slum areas in Dehradun, which are located in low-lying areas along the banks of the Bindal and Rispana rivers. These slums are extremely vulnerable to heavy precipitation, cloud bursts, and water logging, resulting in urban flooding, due to their topography and hydrological sensitivity. As a result, these slums must be relocated to another area of the city with adequate infrastructure.

5.7.4 Provision of Basic Services

Provision of basic services refer to all essential services, which are required for the continuity of life. These services include all the physical as well as social infrastructure facilities such as water, electricity, sanitation, municipal corporations, administrative offices, hospitals, schools, banks, post office, telegraph, etc. Slum areas in Dehradun still lacks in provision of some basic services like drains, sewerage and sanitation.

5.8 LAND ADMINISTRATION AND LAND MARKET

5.8.1 Key Player(s)

In the Dehradun planning area, there are three major land management and development players: UK Housing and Urban Development Authority, UK Real Estate Regulatory Authority, and Private Entities (Real Estate Developers). They are responsible for the city's development over the last decade. Developers frequently maintain very strategic and productive relationships with local government officials, ensuring them the smooth processing of permit applications, the expediting of decisions, or simply less scrutiny in the process.

5.8.2 UK Housing and Urban Development Authority

The authority was established under Section 4 of the Uttarakhand urban and country planning and development act, 1973, with the goal of promoting and securing the development of the development authority area in pursuance of the plan, and they also have the authority to acquire, hold, and dispose of land or any other property, to carry out building, engineering, mining, and other operations, and to carry out works in connection with the supply of water and electricity to the authority.

The major function of authority are to assess the need for declaring/notifying any areas in the State as development areas, and to make recommendations to the State Government in this regard, as well as to recommend the formation of local development authorities for the development authority areas.

5.8.3 UK Real Estate Regulatory Authority

The Uttarakhand Real Estate Regulatory Authority is a department established under the Real Estate (Regulation and Development) Act 2016 with the goal of monitoring real estate activities and increasing investment in the real estate industry while protecting the rights of investors and buyers. The department must also keep a database of all real estate projects on its website. The database contains information and photographs about the promoters or projects whose licences have been revoked.

5.8.4 Real Estate Developer(s)

The Uttarakhand Real Estate Regulatory Authority is the department in charge of overseeing real estate activities in the city, with the goal of increasing investment in the real estate industry and protecting the rights of investors and buyers, as authorized by the Real Estate (Regulation and Development) Act of 2016. Real estate developers work on a variety of large and small-scale,

public and private projects. Currently, 235 projects have been registered with the state regulator, and the regulatory body has certified 246 real estate agents (Singh, 2019)

5.8.5 Land Development Models

There are their various land development models which can be implemented for the development purpose with the participation of real estate developers in Dehradun Planning area such as :

1. Land Acquisition (Under LARR 2013)

This provides legal provisions for the acquisition of land for public purposes. LARR 2013 is the replacement act for the Land Acquisition Act 1989. The new act introduced many changes, the most significant of which is the requirement for consent from the landowner. Consent is very essential under this new act, and the government must obtain consent in percentages based on the project; the consent requirement varies for public projects and PPP projects. Aside from that, the steps involved in the process are:

- Notification of intention to acquire
- Take consent from the land owners
- EIA and SIA of the project
- Notification signifying the final decision to acquire land
- Notices to land owners to hair claims for compensation
- Declaration of land acquisition award and finally taking over of physical possession of land

2. Optimum Utilization of Vacant Govt. land (OUVGL) Scheme

It is a scheme for identifying vacant government land (including municipal land) and using it as a source of public land. However, given the need to generate financial resources from government land, the entire stock of government land does not need to be assigned to non-remunerative public purposes. Before proceeding with compulsory land acquisition, specific designations of land for different uses in the master plan must be made in order to rationalize land demand and supply. In the case of Panchayat land in villages located within the local planning area, these lands must be used for the development of public utilities, services, physical and social infrastructure, such as parks, open spaces, and community facilities, and not for any other purpose.

3. Land Pooling or Town Development scheme

According to the provisions, the development Authority may frame the Town Development Scheme for the purpose of implementing the provisions of the Master Plan or providing amenities where such amenities are not available or are insufficient, and land for various amenities can be earmarked as a result of this provision.

5.8.6 Land Value of Dehradun Planning Area

In a recent development in the city, the minimum collector rate at which a property is registered in Dehradun is increasing, leaving an exception for just few locations. Apart from the real estate development, the city has also got affected from the market slowdown. And with the recession that prevailed in the real estate market after the Covid lock down period. The rapid growth of Dehradun has been accompanied by a boom in prices of land.

The circle rate is effective as of 2018, according to MMDA Notification No. 447/stamp lipik-M.S/2018. Land parcels along the Rajpur road have the highest value in the MDMA area, where non-agricultural land prices range from Rs 50000 to Rs 30000 per square metre (50 m to 350m), multi-story buildings or residential flats cost between Rs 64000 to Rs 44000 per square metre, restaurant or other commercial building costs between Rs 134500 to Rs 93000, and non-commercial building costs between Rs 12000 to 10000. The major areas included in this stretch are the areas between Ghanta Ghar and the RTO office, as well as the RTO office and the Mussoorie Bye Pass. Dhorad khas, Chindowali, and Brahmwla have lower land values rather than other areas of MDMA, with non-agricultural land prices ranging from Rs 9000 to Rs 23000 per square metre (50m to 350m), A multi-story building or residential flat costs Rs 54000 per square metre, a restaurant or other commercial building costs Rs 48500, and a non-commercial building

cost between Rs 12000 and 10000. In between the remaining areas, land prices range from Rs 64000 to Rs 1000 for various purposes. Annexure 1.2 contains more information. Very high price of available buildable land is due to limited availability or scarcity of buildable land in hill towns due to topographical features. Due to the high land price, most of the residents are not able to purchase good buildable land in hill towns. As a consequence, fertile agricultural land in the suburbs or outskirts of hill towns is used for developmental purposes due to its lower price, which is further facilitated by weak land policies, improper development plan proposals and techno-legal regime, and the weak economic background of farmers

5.8.7 Models for the Affordable housing

There are various generic PPP models for Affordable housing which are more suitable for the housing development projects in Dehradun Planning area

Model 1: Government land based subsidized housing:

The public authority will provide land to the selected private developer under this model. This would essentially be a state subsidy for the project. The private developer will be responsible for designing, building, and financing affordable housing stock and associated services to predetermined standards, at a predetermined cost, and within a predetermined time frame. The public authority will agree to compensate the private developer for the housing stock upon completion and handover of the units in accordance with the prescribed standards, cost, and time. The payment to the private developer will be based on project progress as measured by milestones.

Model 2: Mixed Development Cross-subsidized Housing (MDCH)

The primary distinction between this model and the Government land-based subsidised housing model is that the developer receives no payment from the public authority for providing affordable housing stock. The private developer could even be allowed to use the entire land made available by the government for high-end housing in exchange for providing affordable housing at another location, on land arranged by the private developer, as long as the other land's characteristics are similar to those provided by the State. This effectively amounts to a cross subsidy between high-end housing and affordable housing, in addition to the government's subsidy in the form of land.

5.9 ISSUES & POTENTIAL(S)

- Around 20% of the Urban HH's live in the rented accommodation
- Private supply does not have the sufficient provision for the urban poor of the city.
- Housing Density is very high into the core city area which needs to be decongested.
- Lack of availability of secure tenure for the slum dwellers results into the unplanned and unsafe development on higher slopes as well as on the river bed.

5.10 HOUSING DEMAND ASSESSMENT

With an increasing number of slum rental units in the city, the demand for EWS and LIG housing has been increasing. At present, the supply of housing in the city and the region is primarily driven by the private sector. Government authorities have been providing low-cost housing as a part of various national housing schemes and programs. However, *there is a need to analyse the actual demand for such housing and take pro-active measures at (city level. before calculating) the housing need assessment for the Dehradun Planning Area.* Few assumptions have been made for urban areas; those are listed below.

- Based on census 2011, out of the total HH's, 22% are living into the Rented property into the Dehradun city
- There will be decrease into the HH Size from 4.5 to 4 because shift from the traditional joint family structure to nuclear structure.

- Share of Floating Population (Work/ Business/ Education) State Capital + Tourist City + Education Hub – 3 to 5% of the Resident Population or 25 - 30% of the total floating population, Whichever is higher
- Additional housing requirement for the proposed population is coming around 4,37,359. Details are described into the table given below:

Table 5-14: Housing Need Assessment for the Dehradun City for 2041

Sr. No.	Title	No.	Remarks
1	Total HH's in DPA	1,56,259	In Urban Areas only
2	Slum HH's in DPA	30,648	In Urban Areas Only
3	Actual Housing Stock available for the existing population	1,25,611	HH's living in Own Properties (No.) 97,977
			HH's living in Rented Properties (No.) 27,634
4	Total Projected Population	20,47,162	Urban Only
	Considering 4 Person/HH, housing requirement for the proposed residential population	5,11,791	Urban Only
5	Net Housing Requirement for the Proposed Residential Population	3,86,180	Urban Only
6	Floating Population (5% of the projected population)	1,02,358	Floating Population: Work/ Business/ Education 3 to 5% (23,57,815) of the total residential population OR 25 - 30% of the total floating population. Whichever is higher
	Considering 2 Person/HH, housing requirement for the floating population	51,179	
7	Net Housing Requirement for the proposed total population (Dwelling units)	4,37,359	Urban Only

Source: Consultant Analysis

6 ENVIRONMENT AND ECOLOGY

6.1 INTRODUCTION

Dehradun Planning Area is of high environmental importance due to its natural features, morphology and wide variety of flora & fauna present in the area. The identity of the region is a derivative of its natural features and therefore a brief analysis is required to give the perspective for its suitable & inclusive development. Lying in the lower Shivalik ranges, the area has a unique form and supports a diverse range of Wildlife into the Region.

In Dehradun, the topography, sun direction, and soil characteristics collectively impart the region's rich vegetation. Surface water conveniently sinks into the depths of loose boulders and seeps at the bottom of the valley which makes an impermeable band of clay come up to the surface. The abundant rainfall and presence of numerous water bodies provide the basis of rich biomass productivity. This rich vegetation cover in turn helps in the effective management of heavy rainfall and contributes to groundwater recharge. Great genetic diversity in flora has been the collective result of such natural agents for the Dehradun region.

6.2 PHYSICAL FEATURE(S)

6.2.1 Geomorphology and Hydrology

Dehradun Planning Area is one of the largest intermountain valleys ranges between the Lesser Himalaya to the north and the Siwalik Ranges to the south. It is bounded by major faults from all sides; the Main Boundary Thrust (MBT) to its north, the Himalayan Frontal Thrust (HFT) to its south, the Yamuna Tear Fault (YTF) to the west, and the Ganga Tear Fault (GTF) to the east, making it a structurally isolated block. The NW-SE trending intermountain valley is 80 km long and 25 km wide. It is a symmetrical valley with a gentle (0–5°) SW slope and a steeper (0–10°) NE slope. Alluvial fans, hillocks, river terraces, and floodplains are the major geomorphic units in this region, and the valley fills have been described as 'Dun gravels'.

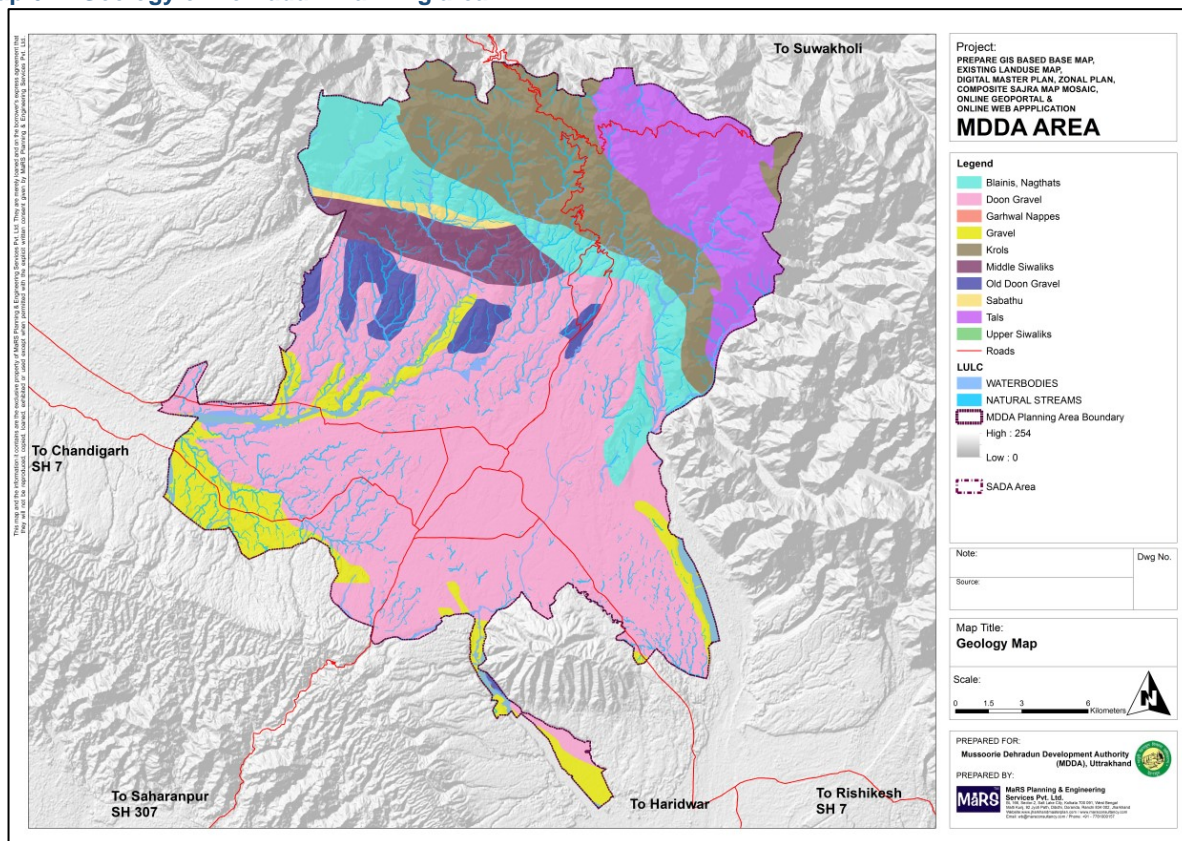
Geomorphology of Dehradun Planning Area is divided into the 4 parts as shown in table below:

Table 6-1: Geomorphology of Dehradun

Sr. No.	Category	Areas	Type
1	Hill Top Surface	Rajpur, Golwari and Kalanga	Thick boulder gravel beds
2	Upper Surface	Between the Rajpur and Golwari hills, Robber's Cave	Small angular to sub-angular gravels of sandstones, phyllite and limestone
3	Middle Surface	—	Less consolidated, weathered gravel beds
4	Lower Surface	Lowest alluvial fan of the major tributaries of the Ganga and Yamuna in Central Doon Valley	Boulder gravel beds

Source: Doon Ghati Master Plan

Map 6-1: Geology of Dehradun Planning area



Source: Doon Ghati Master Plan 2025

6.2.2 Hydrology

The Siwalik zone consists of rocks of Middle (friable, medium grained, grey-coloured massive sandstone and mudstone) and Upper Siwalik (alternate polymictic conglomerate and subordinate grey micaceous sandstone). Groundwater is present under semi-confined and confined conditions and the water table is relatively deep. Although the conglomerate unit of the Upper Siwalik is highly porous and permeable, water quickly leaves the area as surface runoff.

6.2.2.1 River System and Water Bodies

The main water resources in Dehradun planning area are

1. Rispana River System

The Rispana River originates as a small spring from Lal Tibba peaks of Mussoorie hills which is at about 2279 m above MSL and flows through Dehradun City. Adjoining to Rispana there is another river called Bindal which also flows through City of Dehradun and joins River Rispana at Mothrowala.

After the confluence of River Rispana and River Bindal, it is called River Suswa. The Suswa River is the tributary of river Song which joins River Ganga near Satyanarayana between Rishikesh and Haridwar. The river is situated between latitude 300 29" 15" N and longitude to 780 06" 98" E.

Springs in the Agehill, Massifall, Khetwala and Barloganj in the upstream of Rispana river catchment keep feeding round the year and contribute flows even in lean season. A number of other small spring streamlets join on the way to form the famous Shikher Fall (about 4 meters). Thereafter, it flows south-westerly along Rajpur road over Doon gravels and the river course remains dry in the lean season which passes through small hamlets namely Nalapani, Rajpur, Chander Road, Defence Colony, Aamwala, Tapovan, Dandadhoran, Adhoiwala, Gujaram, Ajabpur before joining Bindal River. The catchment area of river Rispana is about 53.45 sq. km and the total length of main river course is about 26.97 km².

a) Rispana River Rejuvenation

The river has been an important part of Dehradun, Uttarakhand, since ancient times. The river has become a polluted stream with momentary characteristics as a result of various factors such as pollution, lack of awareness, development activities, and city growth. It has begun to lose its distinguishing features. To preserve this historic river, the Uttarakhand government has launched an active campaign to revitalise River Rispana, as well as begun planning and actions for the implementation of social, environmental, and engineering measures for river rejuvenation. The river's revival officially began in September of 2017. Given the current concerns about the city's rapid growth and the scarcity of water resources, people from various sectors have been invited to join forces and work for the revitalization of the Rispana River.

Figure 6-1: Water Pollution in Rispana River



The Nation Institute of Hydrology, Roorkee, proposes strategic plans and interventions as part of the Rispana River Rejuvenation programme, based on field investigation, mapping, monitoring, and assessments. The assessments revealed that the Rispana catchment lacks sufficient surface water storage options due to its steep slope. As a result, it is proposed to develop various land and water management interventions that may reduce the amount of rainfall that runs off and increase ground water recharge. Ground water will increase the flow of the Rispana River even after the monsoon season in the hilly portion of the catchment as a result of this increase. Along with this, it is expected that the ground water level in Dehradun will rise, contributing to the Rispana River as base flow during the lean season. There are various measures can be taken for the revival of water bodies: -

- Vegetative measures (plantation of trees, grass barriers and bushes etc. across the slopes)
- Semi-structural measures (contour bunds, terracing, trenching, gully plugging, gabion structure, etc.)
- Groundwater recharge structures (ponds, pits, percolation tanks, bunds, etc.)
- Engineering/structural measures (masonry check dams / stop dams, in-stream storages structures etc.) for water retention and ground water recharge.

2. Suswa River System

River Suswa originates amid the clayey depression near the source of the Asan, towards the East of the Asarori - Dehradun Road. Suswa river drains the Eastern part of Dehradun city and flows into river Ganga after merging with river Song. Dehradun and Doiwala are two major urban settlements situated in the catchment of the Suswa river. Based on water quality data for the years 2016 and 2017, River Suswa from Mothrawala to Raiwala (approximately 31 Km.)

Figure 6-2 :Water Pollution at Suswa River



It has been identified as a polluted river stretch by the Central Pollution Control Board (CPCB) because of high concentration of BOD (>30mg/L).

It becomes essential to revival Suswa River and the water quality because the municipal drains flow from Dehradun with Bindal and Rispana River and merges Suswa.

3. Song River

One of the most important sources of water supply and the largest river in the district is the Song River. This river originates from a natural spring on the southern slopes of the Missouri ridge and flows through the Ladwakot forest of Dehradun. Song River mainly runs through the central and eastern parts of the Dehradun district while making both banks fertile. While crossing the hilly tracks of the Himalayan range, several streams run into this river, carrying various natural minerals.

Two grossly polluting industries are located in the catchment of rivers Suswa and Song. The distillery unit maintains ZLD with Multi Effect Evaporator, while the sugar unit has provided an appropriate effluent treatment plant and maintains effluent discharge norms. Wastewater water from the sugar mill flows into the river Suswa through a small “nalla”.

Figure 6-3 :Song River, Dehradun



6.2.3 Ground Water

There are Six Development Blocks in Dehradun district, out of which Dehradun Planning area falls under Raipur Division and Pithuwala Division, which has water level in range between 6.2 m to 46m. The water level data sets were obtained from the CGWB (Central Ground Water Board) for the months of January 2011, January 2015, and January 2019.

Table 6-2: Level of ground water table in Dehradun

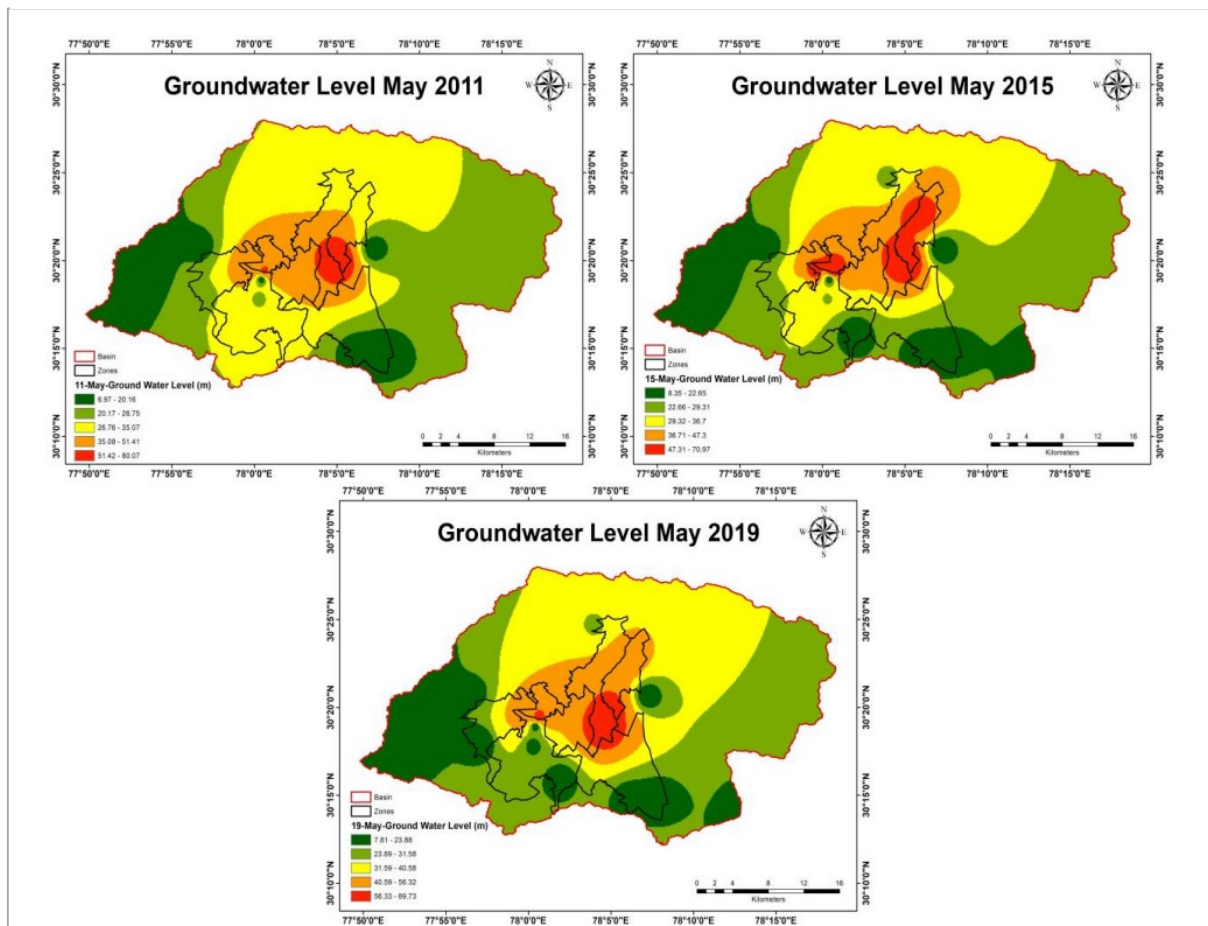
Division and Year	Year	Minimum Water Level (In m)	Maximum Water Level (in m)
Raipur Division	Year 2011	6.2	44.8
	Year 2015	8.9	70.0
	Year 2019	8.9	70.0
Pithuwala Division	Year 2011	10.1	46.0
	Year 2015	9.1	49.6
	Year 2019	9.2	49.6

From 2011 to 2019, the water table in Raipur Division ranged between 6.2 m and 70 m. Despite a population increase in the mentioned years, the storm water run-off is able to recharge the ground water table, and the same is true in Pithuwala Division, where the water table has increased from 10.1m to 49.6m.

6.2.4 Water Recharge Potential

The quality of ground water in District Dehradun varies depending on location and water table depth. The natural drainage network of Dehradun Planning Area will be used to identify ground water potential points. The areas with more vegetation along the natural drainage will be considered high water recharge potential points in the Dehradun Planning area. Rainfall occurs

Figure 6-4: Ground Water Level



between 230mm and 650mm during the monsoon season, but due to elevation, the run off rate is very high, so afforestation should be used in the future to catch and store surface water in order to recharge the ground water table

Modern Building Bye laws 2016 of Dehradun also mandate for Ground Water Recharge for open spaces like parks, parking, plazas and playgrounds. The harvesting and recharge structures could be constructed by the Authority with the involvement of community-based organizations like Resident Welfare Associations and for residential buildings but for all types of buildings, including Group Housing Societies having a plot area more than 500 sq.m. and above.

6.2.5 Rain Water Harvesting

As per the modern building bye laws, 2016, there is a provision for rain water harvesting techniques, the first one is the technique of storage of rain water on surface for future use and second technique is recharge to ground water. Provision is separately given in for the residential purpose, open spaces and green building under section 9.2 of model building bye laws, 2016.

6.2.6 Soil Type

Dehradun has good storm water runoff due to its diverse range of soils. As previously stated, the city is located in the lesser Himalaya and north of the Shivalik's, which have a different type of soil. On steep slopes, the mountainous region has moderately deep, well-drained, thermic coarse loamy soils with strong stoniness, which is associated with shallow, excessively drained, loamy

skeletal soil. Lower Shivalik soils are Udifluventic and Udic Haplustolls soils with deep, well-drained, fine to coarse loamy surface and slight to moderate erosion, silty soil with loamy surface.

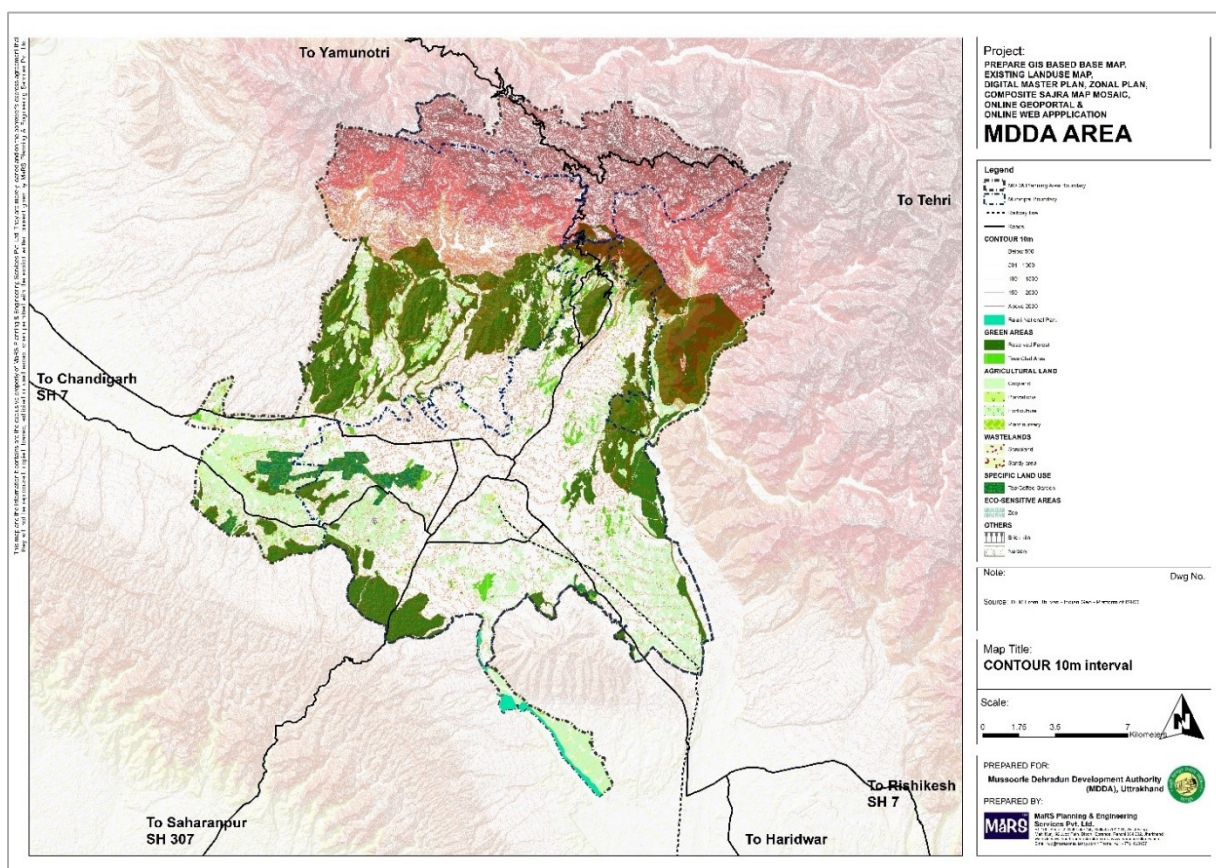
6.3 FOREST AND WILDLIFE

Through various working plans of 1999, 2008, 2009 created by the authorities under the chairmanship of different personnel, it has been noted that forestry has traversed many crossroads in the last few decades but it has never found itself in such a critical phase as it is facing today. The question before us is to find out a 'Sustainable Forest/ eco-system Management' strategy to produce enough goods & services to fulfil the ever-increasing demand of all the stakeholders (local, national & global). A dedicated plan that aims at finding strategies of resource use and mitigating conflicts by providing sustainable ecological proposals, scientific management, and proposals that encourage active participation of the local community is required to ease down these critical phases of ecology.

6.3.1 Forest Classification

From the 6-fold classification of forest with 16 sub-groups by Champion and Seth 1968, Dehradun consists 4 types and 3 sub-groups of forest. Below is the table showing the types of forest, name of forest and area.

Map 6-2: Forest Map of Dehradun Planning area



6.3.2 Forest Range

Dehradun area has 6 forest ranges namely Ashrodi in the south, Lachhiwala in the southeast, Yamuna Circle in the northeast, Jhajra in the west, and Badkot in the centre. Following is the table showing the area of these ranges;

Table 6-3: Forest Ranges in Dehradun Planning Area

Range	Area (Ha.)	Range	Area (Ha.)
Ashrodi	1752	Jhajra	2880

Range	Area (Ha.)	Range	Area (Ha.)
Malsi	1934	Malhan	244
Yamuna Circle	8605	Lachhiwala	47

6.3.3 Fauna

Dehradun is blessed with a rich and bio-diverse ecosystem which at the present moment is in critical condition and needs to be preserved and managed. The forest of this area falls under the West Himalaya Biotic Province Bio-geographical Zone of India as per Wild Life Institute, Dehradun (1998). The forests of the site area are blessed with wide range of plants, forest, vegetation and varying degree of cover which encourages variety of animals, birds, reptiles, rodents and fishes to inhabit.

The important species of animals commonly found in the forest area of the site are classified as under:

Table 6-4: Various Mammals and Birds observed in the forest area

Mammals		Birds	
Common Name	Scientific Name	Common Name	Scientific Name
Tiger	Panthera tigris tigris. Linnacus	Pea Fowl	Pavo cristatus Linnaeus
Leopard	Panthera pardus fusca Mayer	Red Jungle Fowl	Gallus gallus murghi Robinson and Kloss
The Jungle Cat	Felis chaus affinis Gray	Kaleej Pheasant	Lophura leucomelana hamiltonii J.E. Gray
The Himalayan Jackal	Canis aureus indicus Hodgson	Black Partridge	Francolinus francolinus asiae Bonararte
The Hyena	Hyaena hyaena hyaena Linnaeus	Grey Quail	Coturnix coturix coturnix Linnaeus
The Indian Fox	Vulpes bengalensis Shaw	Rain Quail	Coturnix coromandelica Gmelin
Elephant	Elephas maximus indicus Cuvier	Jungle Bush-quail	Perdica asiatica puniaubi Whistler
Goat Antelope	Nemorhaedus goral goral Hardwicke	Green Pigeon	Treron phoenicoptera phoenicopters Latham
Sambar	Cervus unicolor niger Blainville	Grey Horn Bill	Tockus birostris Scopoli
Spotted Deer	Axis axis Erxleben	Pochard	Arthya ferina
Barking Deer	Muntiaous muntiak vaginalis Boddaert	Teal	Anas crecca
Langur	Presbytis entellus schistaceus Hodgson	Tufted duck	Arthya fuligula
Monkey	Macaca Mulatta villosa True	Shoveller	Anas clypeata
Indian Hare	Lepus nigricollis ruficaudatus Geoffroy	Brahminy Duck	Tadorna ferruginea
Porcupine	Hystrix indica indica Kerr	Pintail	Anas acuta
Wild Boar	Sus scorfa cristatus Wagner	Mallard	Anas platyrhynchos
Small Indian Civet	viverricula indica wellsi Poocock	Red-Creasted Pochard	Netta rufina

Mammals		Birds	
Common Name	Scientific Name	Common Name	Scientific Name
Yellow Throated Marten	Martes flavigula flevigula Boddaert		

Source: Working Plan of Dehradun Forest Division, 2007

Table 6-5: Various Reptiles and Fishes observed in the Forest Area

Reptiles		Fishes	
Common Name	Scientific Name	Common Name	Scientific Name
Python	Python molurus molurus Gray	Mahaseer	Barbus tor Hamilton
Rat snake	Ptyas mucosus Cope		
Cobra	Naja naja		
Krait	Bungarus coeruleus Dand		
Pit viper	Trimeresurus monticola Gunther		

Source: Working Plan of Dehradun Forest Division, 2007

Dehradun planning area has a Tiger Reserve and a wildlife sanctuary along with abundant forest ranges habiting various species. Below is the table showing the species population in the planning area over the years. The population of tigers, elephants, leopards, and other species is decreasing over time. All these animals are in crucial conditions, therefore the conservation, protection for forest and fauna need to be taken into priority.

Table 6-6: Deceasing Population of Animals

Species	1988	1993	2005	2007
Tiger	40	18	2	2
Leopard	66	110	61	66
Sambhar	1007	801	251	80
Cheetal	4612	4593	1290	1079
Wild Pig	1419	988	N.A	N.A
Neelgai	310	416	71	80
Ghooral	270	148	58	17
Rhesus Monkey	4404	3902	N.A	N.A
Langur	3847	3207	1757	
Elegant	338	310	27	27

Source: Working Plan of Dehradun Forest Division, 2007

Dehradun planning area has a varied range of species and stands out to be of great interest in terms of Botany. It has suitable climatic conditions for both tropical and temperate vegetation and therefore, many foreign floral species are being housed. These are distinct from the usual Himalayan vegetation.

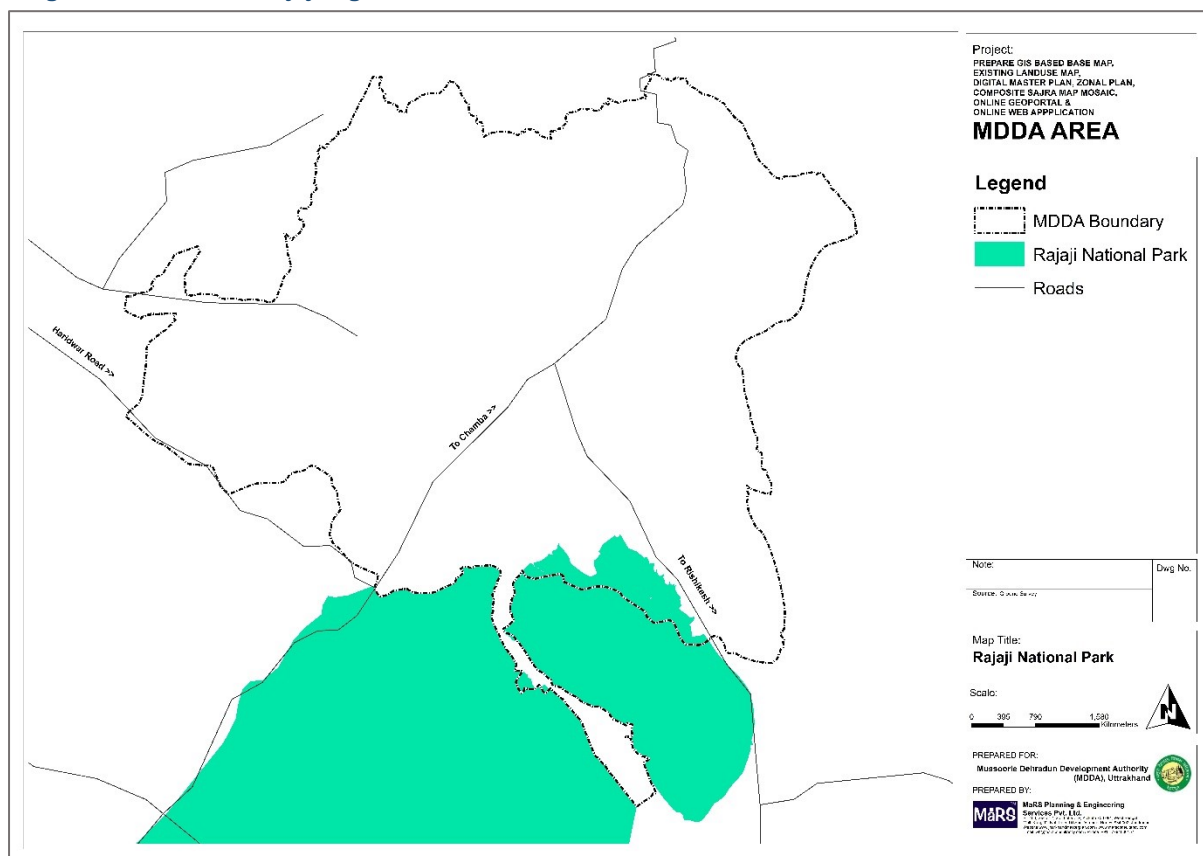
6.3.4 Rajaji Tiger Reserve:

Rajaji Tiger Reserve is an Indian national park and tiger reserve located in the Shivalik's, near the Himalayan foothills. This park was established in year 1983. It spans in area of 820.42 square kilometres and three districts in Uttarakhand: Haridwar, Dehradun, and Pauri Garhwal.



Uttarakhand Cabinet in a cabinet meeting declare an area of 270 sq. km outside Rajaji National Park as eco sensitive zone (ESZ) (source: Shivani Azad / TNN / Feb 28, 2020, 04:01 IST, Times of India)

Figure 6-5 : Area of Rajaji Tiger Reserve in MDDA area



6.4 ECO SENSITIVE AREA(S)

The entire area of planning area is located in the Doon valley. Preliminary, Doon valley Eco-Sensitive Area (ESA) Notification was issued by MoEF in October 1988. After which all the mining

activities were closed down by the Supreme Court in December 1988. In February 1989 final Doon valley ESA was notified. Dehradun Planning Area is bounded in the north-east by the lesser Himalayan ridge, in the south-west by the Shivalik ranges, the Ganga in the south-east and Yamuna in the north-west. The Rajaji National Park is the largest Shivalik ecosystem. It includes the Rajaji Sanctuary, the Motichur sanctuary, and Chilla Sanctuary. The Doon valley is also known for its perennial streams and greenery. The Chronology of events around the Doon Valley Notification is described in the table below:

Table 6-7: Chronology of events around the Doon Valley

Event	Year
Mining leases were granted in the Doon Valley	1962
Working Group was constituted by the Union Government to ascertain the impacts of mines	1983
Several PILs were filed by the citizens of Dehradun in the Supreme court against the limestone mining	1983
The Supreme court appointed the Bhargava committee for the inspection of mines which categorized the mines into A, B, and C categories	1983
The Supreme court ordered the immediate & permanent closure of C category mines	1985
Supreme Court ordered to completely stop mining in Doon valley permitting only those mines whose lease period was not over	1985
Constitution of SCMC to oversee the working of mines whose lease period has not yet expired	1988
Preliminary Doon Valley ESA Notification got issued by the MoEF	1988
Supreme Court directed the closure of all the mines	1988
Final Doon Valley ESA Notification was gazetted	1989

Source: Doon Ghati Master Plan, 2031

Doon Valley was the second ecologically sensitive/ fragile area to be notified by the MoEF. In a way, the Doon valley ESA Notification was the first of its kind. Several restrictions were laid which are to be imposed in the valley.

- MoEF's approval to be taken to begin any mining activity
- MoEF guidelines on the categorization to be followed while deciding the location of industries
- Grazing allowed only in the areas notified in the approved plan by the state government and further MoEF;
- Tourism to take place as per a Tourism Development Plan to be prepared by the state government after MoEF's approval;
- Land use to be in accordance with the Master Plan approved by the state government and approved by the MoEF.

In ESA Notification, industries are classified into three categories namely Green, Orange, and Red

6.4.1 The Shivalik Hills and Gangetic Plain Landscape

The Shivalik's are a Tertiary formation made up of alluvium deposits brought down by the fluvial action from the Himalayas millions of years ago, and later thrown up in the form of a range of hills covered by a multi-tier moist deciduous forest. The lowest slopes of Shivalik's are enriched in a large proportion of clay and good drainage, which provide the best soil for the growth of Sal trees. That is the predominant forest species in the area and forms the northern tropical moist and dry deciduous communities along with its associates. The Shivalik's play a crucial role in supporting the incredibly rich bio-diversity and wildlife values of the region. The direct productivity and the ecological services rendered by the Shivalik's are of crucial importance to people residing in or near this tract. It is adjoining the Dehradun site area and some part of the range is included in the site area. With the proximity to the Shivalik range, the site area holds significant importance and is ecologically critical. The entire range and landscape have 4 Tiger Reserves with about 351 tigers.

6.4.2 Elephant Reserve

India has 33 elephant reserves (ERs) distributed across 14 states. Elephant reserves reflect the wide-ranging habits of their main wards: since elephants only spend some 60% of their time in the smaller spaces designated as protected areas, elephant reserves include large areas that can encompass not only national parks and wildlife sanctuaries but also reserve forests, conservation reserves, and community reserves where human access is permissible. As of 2010, of the 65,000 sq. km. covered by India's elephant reserves about 1.9% of India's territory only 29% fell under well-demarcated protected areas, i.e., wildlife sanctuaries and national parks.

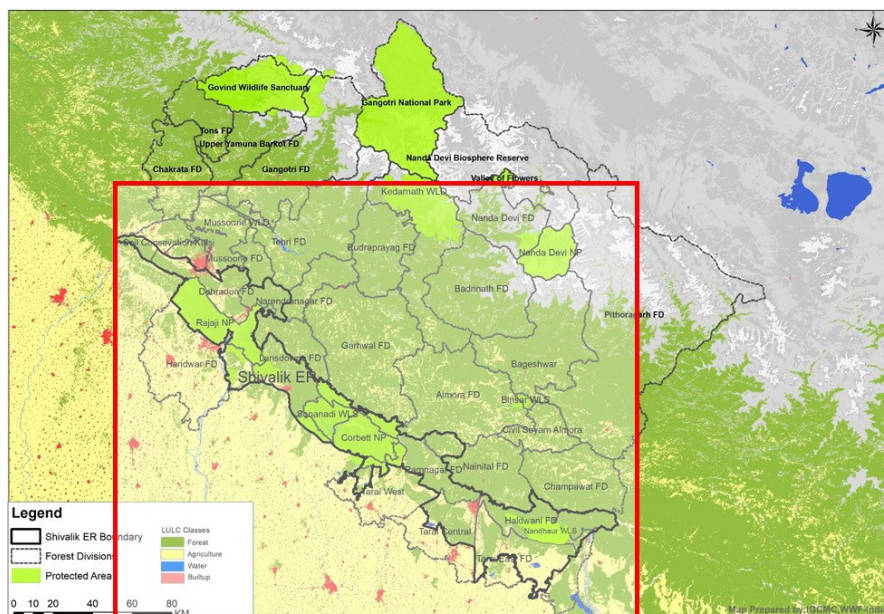
There are two main ways that could help protect elephants.

- **Through funds:** notifying an area as an elephant reserve helps direct funds from the central government to that region for elephant conservation.
- **Through reserves:** while elephant reserves do not offer the official legal protections that come with tiger reserves, they do offer a thin added layer of de facto protections, effectively encouraging decision-makers to remember the costs of allowing land-use change that could reduce elephant habitat or block their movement.

The government's 2010 Elephant Task Force recommended that elephant reserves be given Ecologically Sensitive Area status under the Environmental Protection Act, 1986. However, elephant reserves play a crucial role in safeguarding elephant habitat. This can be seen in the case of Shivalik Elephant Reserve which is adjoining the Dehradun planning area with some parts including in the boundary.

Recently at the end of 2020, there has been a debate about DE notifying Shivalik Elephant Reserve in Uttarakhand.

Map 6-3: Forests and Grasslands protected by Shivalik Elephant Reserve

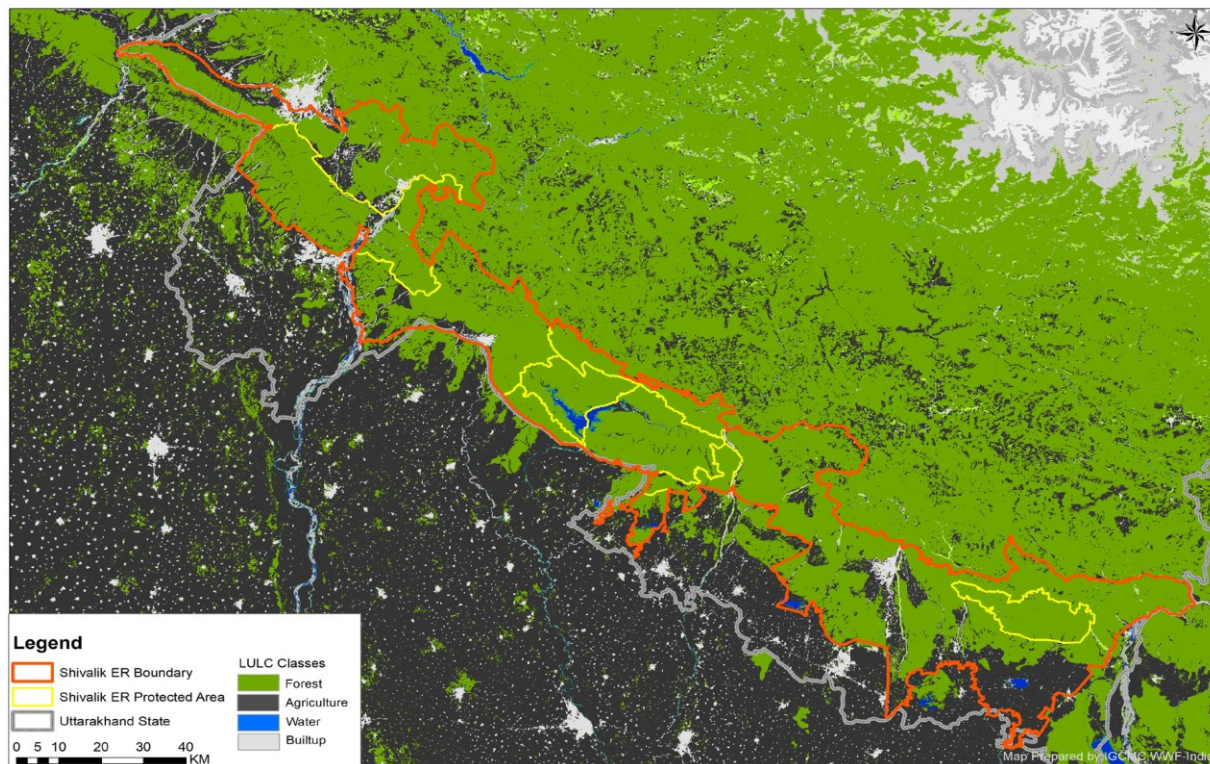


Source: *The Critical Need for Elephant Reserve, WWF India*

The maps above show how the forests and grasslands protected by Shivalik Elephant Reserve serve as crucial elephant habitat that is under tremendous pressure. Shivalik Elephant Reserve designates a region of supreme importance for elephant conservation. As of the latest elephant population estimation in 2017, Shivalik Elephant Range has habited to almost all of Uttarakhand's 1839 wild elephants about 6. 7% of India's total wild elephants, and a surprising 88% of India's north-western elephant population. It is thus the most essential habitat for the elephants of northern India. Much of this habitat falls inside protected areas: Rajaji National Park, Corbett Tiger Reserve, Nandaaur Wildlife Sanctuary, and Sonanadi Wildlife Sanctuary protect 2,213 sq. Kilometres of habitat and form the core of Shivalik Elephant Reserve. Outside of these protected areas, it

includes about 3,269 sq.km. of forests and grasslands usable by elephants in other words, about 60% of elephant habitat in the region falls outside of PAs but inside Shivalik Elephant Reserve

Figure 6-6: Location of Elephant Reserved Protected Area



Source: *The Critical Need for Elephant Reserve, WWF India*

Overall, the green spaces show habitat usable by elephants while all the black, gray, and gray-green indicate barriers and partial barriers to elephant habitat use. This map demonstrates how Shiwalik protects the thin space of habitat still fully suitable for North India's last remaining major Asian elephant population. About 3,269 sq. km. of forest and grasslands are protected by Shiwalik but outside of national parks and wildlife sanctuaries constitute 6.6% of the area of Uttarakhand.

6.4.3 Asan Conservation Reserve, Ramsar

The Asan Reserve is 444.4 hectares of land under conservation about 18 kilometres from the Dehradun Planning area. It falls under the biogeographic zone, Gangetic plains (7), and biogeographic province, Upper Gangetic plains (7A). The village Dhalipur forms the eastern boundary of the conservation reserve, Kunj, Kuna, Aduwala, and Ramgarh lie on the southern boundary of the conservation reserve. Village Matak Majri and the confluence area of river Yamuna and river Asan forms the western boundary of the conservation reserve.

6.4.4 Ecological Character:

The Conservation Reserve mainly consists of stretches of rivers Asan and Yamuna River beds, a reservoir area, islands and areas covered with terrestrial vegetation, which include natural forest patch, scrublands and plantation area.

Figure 6-7: Asan Conservation Reserve



Source: Asan Conservation Reserve, Ramsar Site Information Services

6.5 POLLUTION

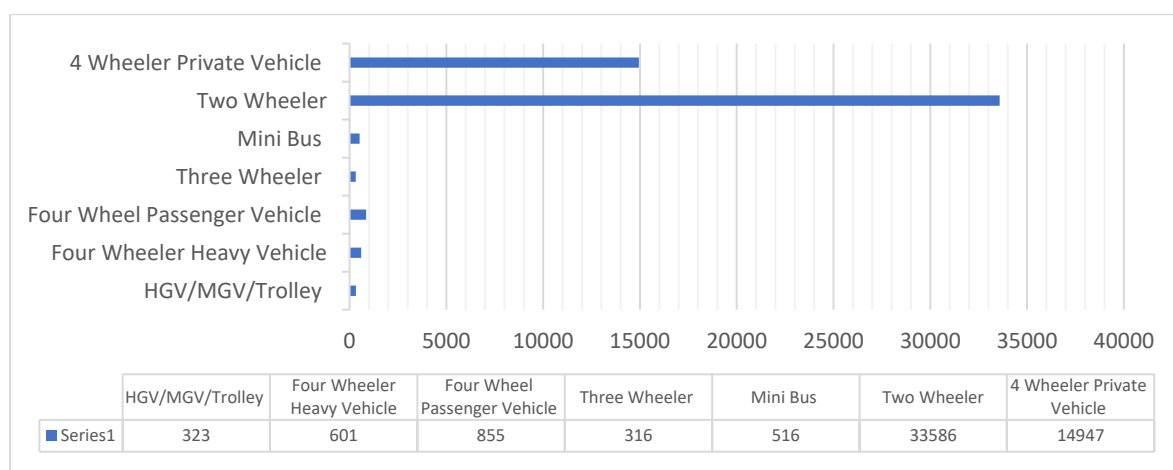
6.5.1 Air Pollution

Dehradun city is a growing city with a growing urbanization rate resulting in creating pressure on the resources and air quality of the city. There was a time when Dehradun entered the list of 10 worst cities with an average of 283 (Greenpeace report, Apocalypse 2017). As per the Central Board Quality Index report released in January 2018, Dehradun out of 273 cities, was listed 241. 5 and PH10 levels of Dehradun were much higher than the standards. Dehradun, Kashipur, and Rishikesh are on the list of non-attainment cities under the National Clean Air Programme of India prepared by the National Green Tribunal in the year 2018.

6.5.1.1 Source of Pollution

Vehicular emission is the main source of air pollution. The increasing amount of vehicle since past few decades has adversely affected the air quality. According to the road transport authority, only 10,000 vehicles were registered in Dehradun between 1937 and 1967. At present, there are more than 126,452 vehicles plying on the roads with more than 100,000 of these are two-wheelers. However, the length and width of roads have increased only marginally. A study by the Dehradun-based People's Science Institute (PSI), a non- governmental organization, says that the high levels of pollution in Dehradun are mainly due to natural dust and particulate-laden smoke from diesel-fuelled vehicles, especially Vikram's, trucks, buses and three-wheelers. Another cause for concern mentioned in the same report are two-wheelers.

Graph 6-1: No. of vehicles registered in Dehradun



Source: Pollution Control Board, Uttarakhand

6.5.1.2 Air Quality

There are 03 manual ambient air quality monitoring stations at Dehradun being operated by Uttarakhand Pollution Control Board (UKPCB). The monitoring stations calculate the ambient air quality of three pollutants – PM10, NOx and SOx. PM2.5 since January 2019. Based on ambient

air quality levels the pollutant of concern is PM₁₀ & PM_{2.5}. Test results indicate that all aforementioned parameters have been found well above limits prescribed by CPCB/UEPPCB except NO₂ which is lesser than the prescribed limits.

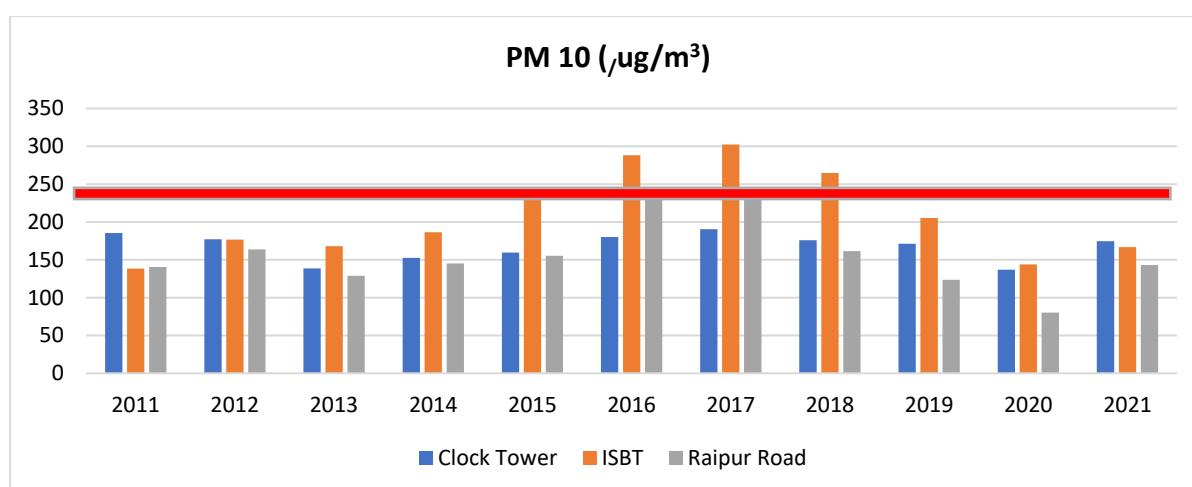
Table 6-8: Air Quality standards

Pollutants (µg/m ³)	Sensitive Area Standards
PM ₁₀	60
SO ₂	20
NO ₂	30

Source: Central Pollution Control Board

Concentration of PM₁₀ (µg/m³) has increased over past years during the duration of 2011 to 2017. At clock tower and ISBT the PM₁₀ (µg/m³) was at same level during 2012, but then it has increased at ISBT remarkably as compared to Clock Tower.

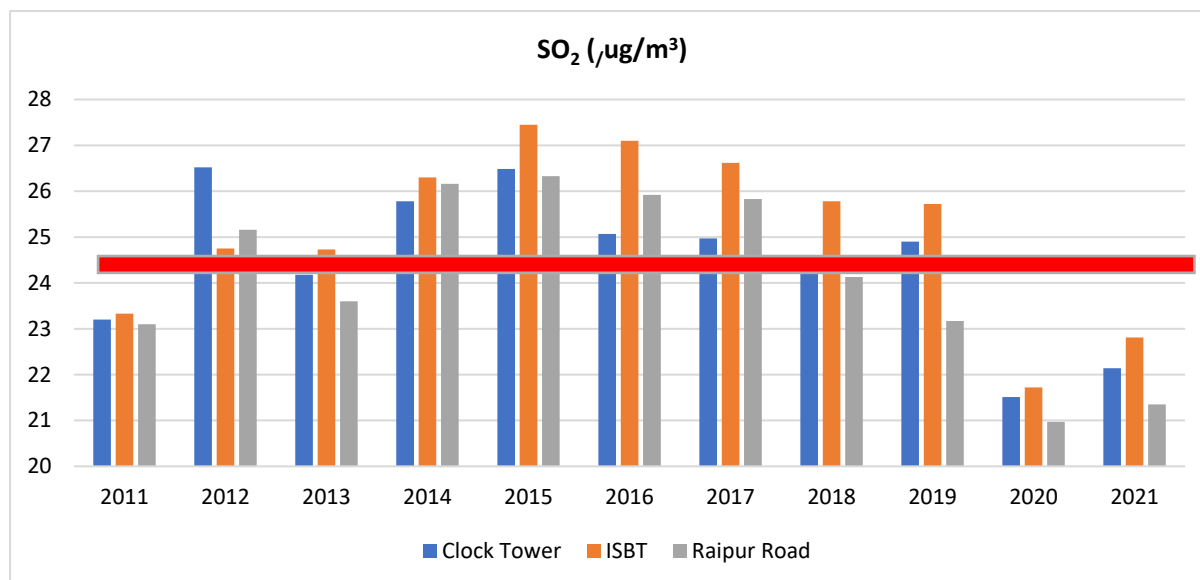
Graph 6-2: Concentration of PM 10 in Dehradun Planning Area



Source: Uttarakhand Pollution Control Board

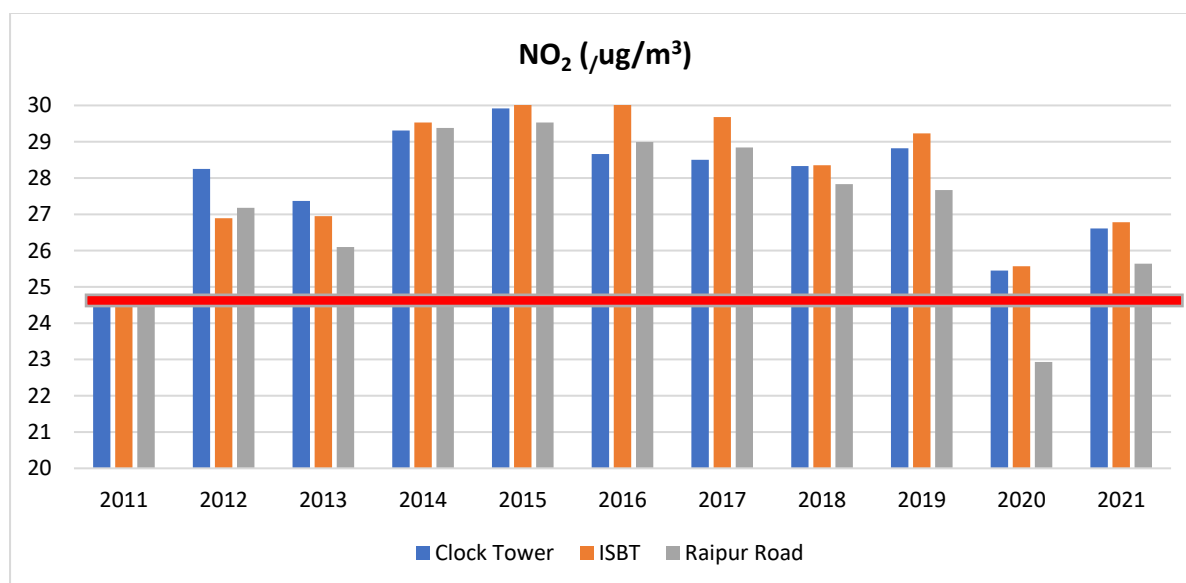
In 2017, a decrease is observed into the concentration of PM 10 especially in the year of 2020 when nationwide lockdown was implemented due to the COVID 19 Pandemic

Necessary steps have been taken to reduce the concentration of PM 10 in Dehradun Planning Area since 2018. Also, the concentration of SO₂ is also started decreasing especially after 2015. Sudden decline is also observed in the concentration during the pandemic.

Graph 6-3: Concentration of SO₂ in Dehradun Planning Area


Source: Uttarakhand Pollution Control Board

Concentration of NO₂ is also observed within the desirable limit in the Dehradun Planning Area. A decrease is started after 2015. Same as all other parameters, Concentration of NO₂ at its lowest during the lockdown.

Graph 6-4: Concentration of NO₂ in Dehradun Planning Area


Source: Uttarakhand Pollution Control Board

Dehradun is prone to the temperature inversions which affect air pollution because they change the dynamics of air movement. Further, industry is not a major cause of air pollution in the city as red category industries are not allowed to operate in Dehradun.

6.5.2 Noise Pollution

Transportation and horn used in vehicles are the major source of noise pollution in Dehradun City. For the purpose of monitoring the noise pollution, a study was carried out at 7 different major locations with Sound Level Meter to assess the day and night sound level in Dehradun City.

There are four categories of area to monitor the noise levels. The standards are given by the Central Pollution Control Board.

Table 6-9: Noise Quality Standards by Central Pollution Control Board

Area code	Category of area	Daytime	Night time
A	Industrial Area	75	70
B	Commercial Area	65	55
C	Residential Area	55	45
D	Silence Area	50	40

Source: Noise level Standards by Central Pollution Control Board

Here, Day time means the time from 6.00 a.m. to 10.00 p.m. Night time means the time from 10.00 p.m. to 6.00 a.m. Silence zone is an area comprising not less than 100 metres around hospitals, educational institutions, courts, religious places or any other area which is declared as such by the competent authority. Mixed categories of areas may be declared as one of the four above mentioned categories above.

It is observed that all the selected locations, the level of noise was found to be above prescribed noise standard level especially in Commercial Areas. While during the lockdown, the noise level was observed within the desirable limit.

Table 6-10: Noise Quality at various monitoring stations of Dehradun

Monitoring Station	Zone	01	02	03	04	05	06	07	08	09	10	11	12
Survey Chowk	Commercial	70	68	70	51	71	72	74	70	70	71	69	70
Doon Hospital	Silence	58	57	55	47	53	55	57	71	61	62	67	63
Clock Tower	Commercial	73	71	71	57	71	71	70	68	73	73	69	73
Gandhi Park	Silence	53	56	54	44	52	55	53	64	58	58	62	57
CMI Hospital chowk	Commercial	64	69	71	55	71	74	72	65	68	67	66	67
Race Course	Residential	54	50	52	41	54	52	50	47	50	57	56	52
Nehru colony	Residential	54	54	54	43	55	56	54	56	56	56	55	57

Source: Uttarakhand Pollution Control Board, 2021

6.5.3 Surface water Pollution

Surface Water Quality is monitored under two different programs by Central Pollution Control Board and those are:

6.5.3.1 GEMS Project

The Board assists the CPCB (Central Pollution Control Board) in implementing the GEMS (Global Environmental Monitoring System) project since 1980. The scope of this project includes an assessment of the quality of water of the major rivers of the State.

6.5.3.2 MINARS project

On account of various discharge of wastewater in river, the quality is likely to be adversely affected. It is therefore, necessary to monitor the quality of the river water. This is a continuous project of previous years as approved by the CPCB and known as MINARS (Monitoring of Indian National Aquatic Resources System) Project.

The Surface Water Quality Standards as per Central Pollution Control Board is described below:

Table 6-11: Water Quality Standards by Central Pollution Control Board

Sr NO	Parameter	Characteristics of Water body				
		A	B	C	D	E
1	Dissolved Oxygen (mg/L)	6	5	4	4	3
2	BOD (mg/L)	2	3	3	-	-
3	pH	6.5-8.5	6.5-8.5	6.5-8.5	6.0-8.0	6.0-8.0

Source: Central Pollution Control Board

Surface Water Quality is monitored at 4 different locations in Dehradun Planning Area and those are:

- River Ganga at Raiwala
- River Suswa at Mathurawala
- River Yamuna at Lakhwar Dam
- River Yamuna at Dakpathar

Their detailed analysis is given below: Acceptable limit of pH is around 6.5 to 8.5. The detailed analysis of pH of surface water from 2012 to 2021 is given below. The permissible limit of pH is 6.5 to 8.5. PH > 8.5 is reflecting basic of water and pH < 6.5 is reflect acidic of water. Result PH

The shows the pH of river water is within the permissible limit.

Table 6-12:Details of pH level

PH				
Year	Ganga_Raiwala	Suswa_Mathurawala	Yamuna_Lakhwar Dam	Yamuna_Dakpathar
2012	7.9	7.4	—	—
2013	7.85	7.7	—	—
2014	7.7	7.59	—	—
2015	7.6	7.8	—	—
2016	7.58	—	7.8	—
2017	7.49	7.54	7.78	—
2018	7.68	7.78	7.78	—
2019	7.96	7.79	7.8	—
2020	8	8.1	8.46	8.1
2021	7.9	7.5	7.5	7.5

Source: Central Pollution Control Board – Uttarakhand

6.5.4 Ground Water Contamination

Heavy metal concentration is also observed into the ground water of Dehradun Planning Area. Their details are given below:

Table 6-13: Concentration of Heavy Metals in Dehradun Planning Area

Heavy metals	Mn (mg/l)	Al (mg/l)	Ba (mg/l)	Cd (mg/l)	Cr (mg/l)	Co (mg/l)	Cu (mg/l)	Fe (mg/l)	Pb (mg/l)
Dehradun	0.053	0.056	0.079	0.133	0.096	0.064	0.021	0.067	0.088

Source: (Analytical study of water safety parameters in ground water samples of Uttarakhand in India, 2011)

*Mn – Manganese, Al- Aluminium, Ba- Barium, Cd- Cadmium, Cr- Chromium, Cu- Copper, Fe- Iron, Pb- Lead

The physio-chemical characteristics of drinking water of Dehradun is presented in the table below. Drinking water of all the regions contains higher amounts of TDS than the desirable limits. But the chloride content was above the BIS desirable level of 250mg/l in Dehradun.

Table 6-14: Physio Chemical Characteristics of Dehradun

Sr.no	Parameter	BIS Standards (mg/l)	Dehradun
1.	pH	6.5-9.2	7.2
2.	Alkalinity	Desirable: 200 mg/l , Permissible: 600 mg/l	288.25
3.	Total Hardness (TH)	Desirable: 300 mg/l , Permissible: 600 mg/l	290.5
4.	TH (As Ca ⁺⁺)		290.5
5.	TH (As Mg ⁺⁺)		40.5
6.	TDS	Desirable: 500 mg/l , Permissible: 2000 mg/l	610
7.	Suspended Solid		22
8.	Chloride	Desirable: 250 mg/l , Permissible: 1000 mg/l	289.0
9.	Sulphate	Desirable: 200 mg/l, Permissible: 400 mg/l	170

Source: (Analytical study of water safety parameters in ground water samples of Uttarakhand in India, 2011)

6.6 NATURAL HAZARD PROFILE

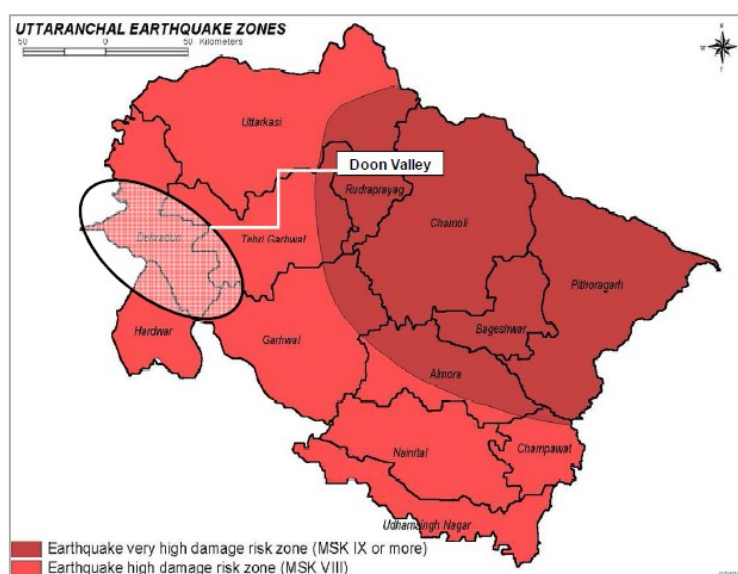
6.6.1 Natural Disaster in Uttarakhand

Along with the rich ecology and diversity, Uttarakhand is also known for growing frequency and intensity of natural disasters. Consisting mostly uplifted sedimentary and metamorphic rocks, and tectonically very active, the region is vulnerable to natural disasters. Due to its geo-climatic, ecological, socio-economic setting, Uttarakhand is one of the most disaster-prone states in India.

6.6.2 Earthquake

Uttarakhand state is covered in 2 zones i.e., Zone IV and Zone V. The region has experienced many small and large earthquakes throughout years with their epicentres located within the Himalayan region.

Map 6-4: Uttarakhand Earthquake Zones



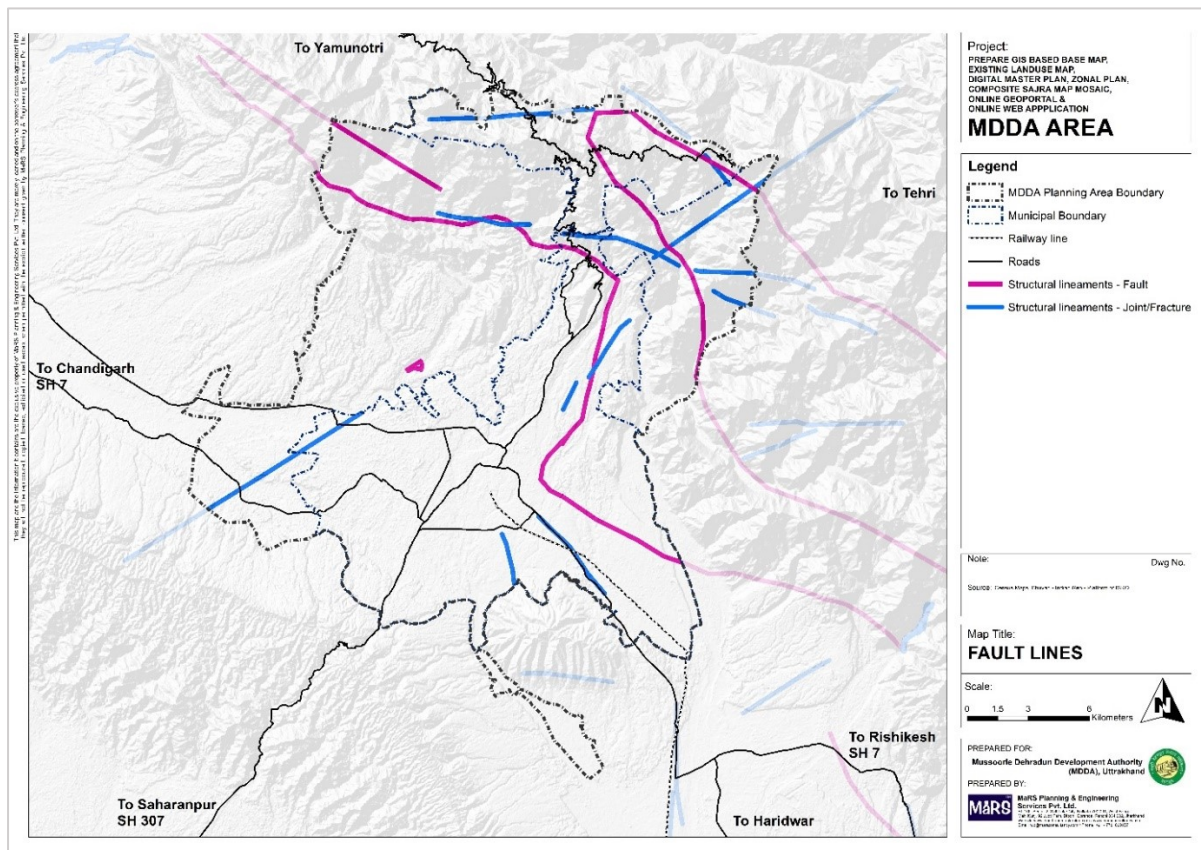
Source: Urban Development and Poverty Alleviation

As seen in the map above, four (Chamoli, Pithoragarh, Bageshwar, and Rudrapur) out of thirteen districts completely comes under Zone V which represents damage risk of >XI or more on MSK scale. Whereas other five districts (Uttarkashi, Tehri-Garhwal, Pauri, Almora, and Champawat) fall partially in Zone IV and partially in Zone V that represents the damage risk of VIII on MSK scale. Rest of the districts (Dehradun, Haridwar, Nainital, and Udgam Singh Nagar) falls under Zone IV of earthquake risk levels.

6.6.3 Fault Lines

The valley region has a great influence of the major Himalayan tectonic discontinuities. First is the Himalayan Frontal Fault (HFF), which passes parallel to the Shivalik range and lies on the southern foot. Second is the Main Boundary Thrust (MBT), which passes parallel with the foot of the lesser Himalayas along Doon valley. The third fault line is called Main Central Thrust which passes through Dehradun parallel to the Himalayan range.

Figure 6-8: Fault Lines passing through the MDDA Planning Area



Source: Consultant Analysis

This location along two fault lines makes the region highly seismic – it is classified as a zone IV region, the second-most vulnerable category.

6.6.4 Floods

The problem of floods is mainly experienced in the Dehradun blocks namely Sahaspur, Vikas Nagar, Raipur and Doiwala. Therefore, various rivers are flowing down from Dehradun and Tehri Garhwal districts assemble their flow in these blocks. Few of these rivers are Ganga, Song, Suswa, Rispana, Tons and Asan. All the mentioned rivers pose a big threat of flood in the rainy season.

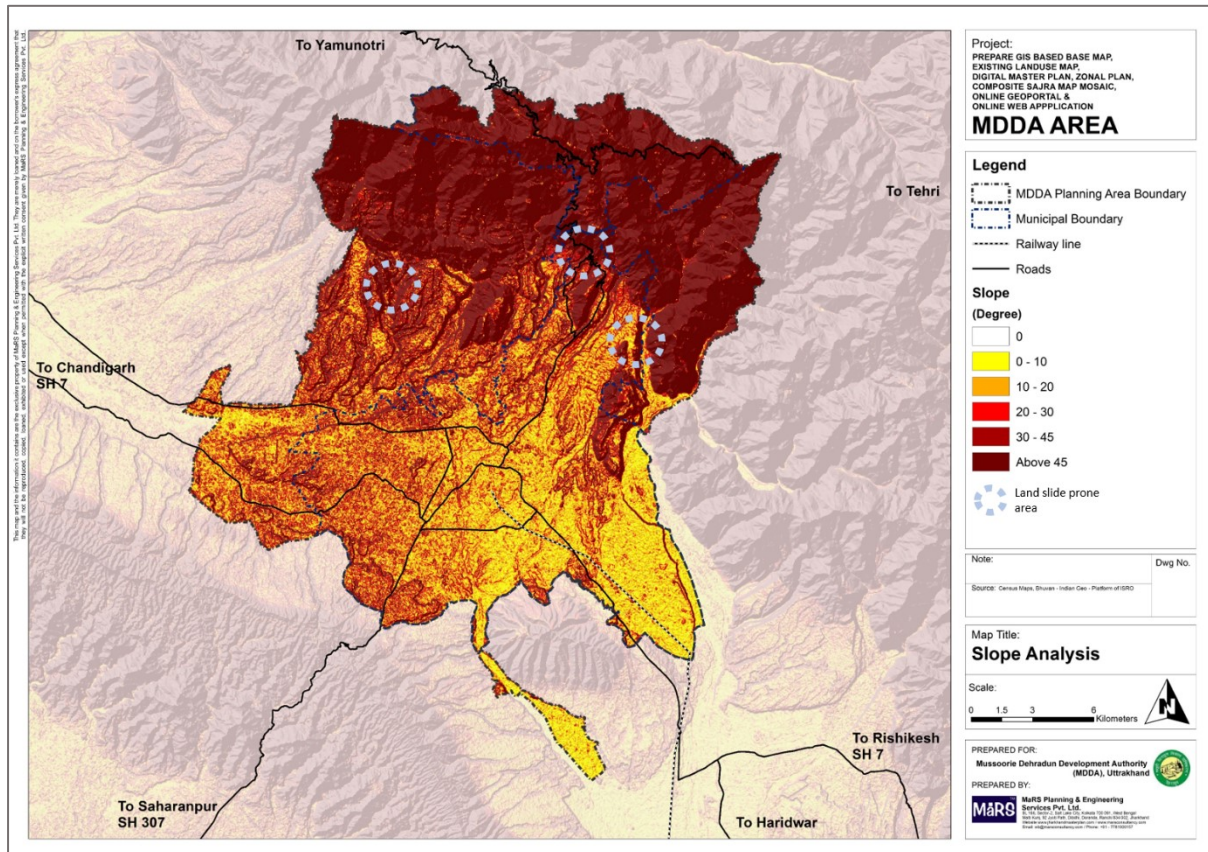
Rainwater channels flowing down in Rajaji National Park need to be managed at the upper watersheds as they end up as a great damage in rainy season. Water flowing with rigorous velocity erodes the soil which adversely harms the vegetation and affects cultivation adversely. Loosen up soil encourages slipping of land masses due to which landslides occur. It becomes a serious problem in rainy seasons. Rainfall particularly in the Doon Valley is often punctuated by flashes of

cloudburst. Dehradun began to see regular flooding after 2010. The most vulnerable are the migrant construction workers, hawkers and vendors.

6.6.5 Land Slides

Uttarakhand has witnessed many landslides in past creating crucial conditions. Below is the landslide hazard zonation map of the state. Dehradun falls under the category of Highly vulnerable zone of landslide with some parts falling under severe to very high landslide vulnerable zone.

Map 6-5: Landslide prone areas in Dehradun Planning area



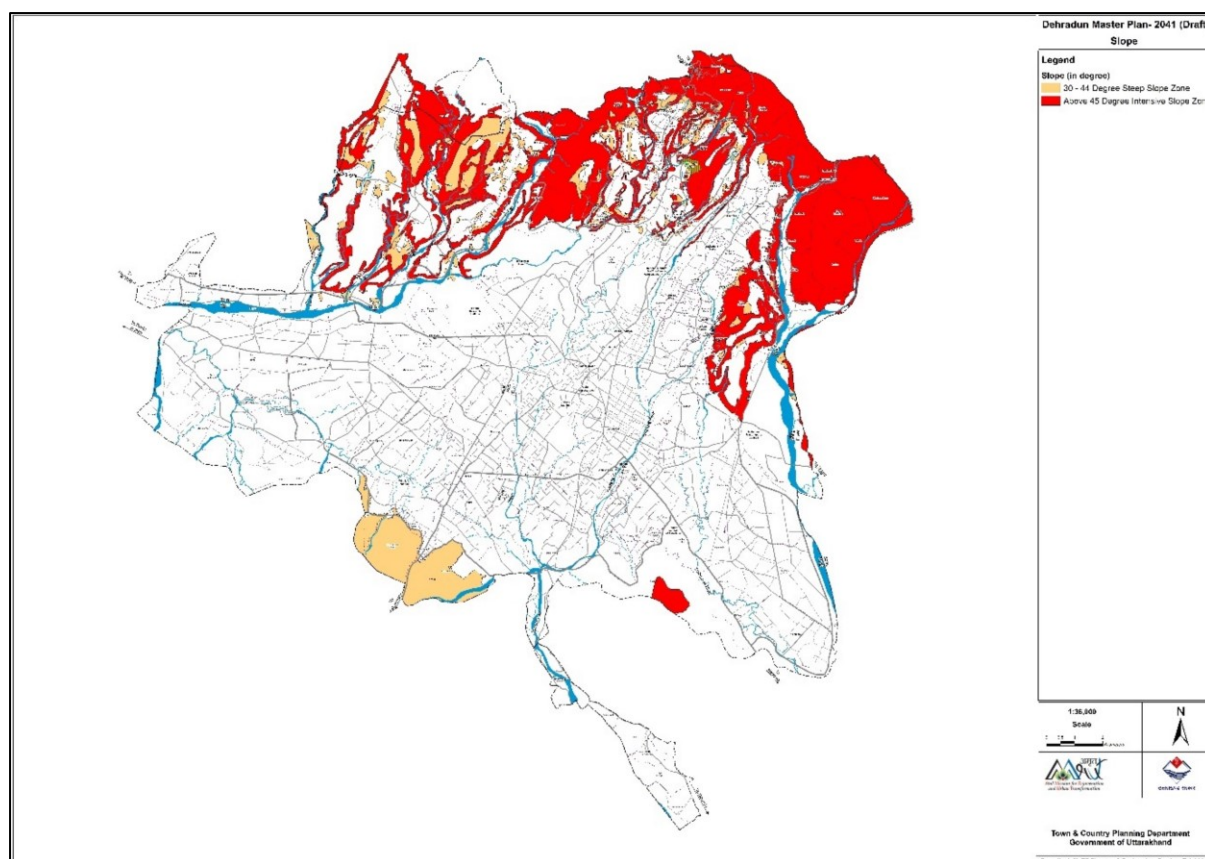
Source: (National Institute of Disaster Management, 2015)

There are three major land slide prone areas in MDDA planning area which has a slope more than 30° angle, located on Shahastradhara road, Guniyal Gaon and Gajiyawala.

6.6.6 Vulnerable Slope Analysis

The slope of Dehradun is above 45, which is the highest in the north due to the hills. The south of the city has the lowest slope between 0-10, and the rest of the area lies between approximate slope of 10-30 degrees. The slope is generated from DEM raster data from open-source Bhuvan Indian Geo Platform of ISRO. The final output was generated with the help of slope tool analysis in ArcGIS Software. The following map given below explains the different types of slopes existing in Dehradun Area.

Figure 6-9 Dehradun Map showing Steep Slope and Intensive Slope



Source: Bhuvan Indian Geo Platform

6.7 GOVERNMENT INITIATIVES TO MITIGATE NATURAL DISASTER

6.7.1 Environment Impact Assessment

EIA was first introduced in 1978 with regard to various river valley projects throughout the country, and its scope was later expanded to include various other developmental procedures. EIA is now required for over 30 different types of projects. The Environmental Protection Rules, 1986 authorise the imposition of certain restrictions on the construction/expansion/modernization of specific projects without prior approval from the Environmental Impact Assessment Authority (EIAA) established under the Environment Protection Act, 1986 at the Central, State, or Union Territory level.

6.7.2 Social Impact Assessment

The right to Fair Compensation and Transparency in Land Acquisition, Rehabilitation and Resettlement (LARR2 2013) Act 2013, has made social impact assessment (SIA) a provision of the new regime that seeks to establish a participative informed and transparent process of land acquisition for industrial and infrastructure development in India and same is applicable in Dehradun planning area for the land acquisition process for the infrastructure development projects.

6.7.3 Declaration of No Development Zones

According to the Zonal Development Plans, all types of developmental activities are prohibited in Dehradun's Cantonment Area. However, special exemptions are granted if the development is done in the Cantonment's best interests. Furthermore, no construction is permitted in Water Body zones, as well as a buffer belt of at least 30m around the FTL and a 5m green area. The only activities that are exempt are fishing, boating, picnics, and the construction of their platforms.

Eateries and rain shelters are exempted if they are within ten square metres of a water body and do not exceed four in number.

6.8 ISSUES AND POTENTIAL(S)

- Maximum Dehradun Planning Area is having sandy loam soil which is fertile in nature.
- Rich vegetation cover helps in the effective management of heavy rainfall and contributes to ground water recharge.
- Forestry has transformed in last few decades but it has never found itself in such a critical phase as it is phasing today.
- Around 48 sq. km. area is under the forest division covering 6 major types of Indian Forest with variety of species. Apart from that, 6 forest rangers are available within the Dehradun Planning Area which makes it ecologically more important region of the State and of the Nation.
- Forest is blessed with wide range of plants, forest, vegetation and varying degree of cover which encourages variety of animals, birds, reptiles, rodents and fishes to inhabit.
- It has suitable climatic conditions for both tropical and temperate vegetation and therefore, many foreign floral species are being housed. These are distinct from the usual Himalayan vegetation.
- The Shivalik Hills and Gangetic Plain adjoining the Dehradun Block area holds significant importance and ecologically critical. The entire range and landscape have 4 Tiger Reserves with about 351 tigers.
- Climate, fire, Plants, Human Interference, Animals are the major factors those are affecting the Flora and Fauna of the region.
- Shivalik Elephant Reserve designates a region of supreme importance for elephant conservation.
- The entire area of Dehradun is located in the Doon valley. Due to that reason, certain activities are not permitted into the region such as: mining, heavy chemical industries and other activities those are harmful to the environment.
- Some of the natural resources such as Suswa River, Rispana River and Bindal River are in the dilapidated conditions. Rejuvenation Plans are already proposed to control the various factors that cause damage to the river.
- Necessary steps have been taken to reduce the pollution into the city. But, still the concentration of PM10 is higher than the desirable limit.
- Noise level above the desirable limit is observed especially in the silence zones and commercial areas.
- Fault lines are passing within the city limit. But there is no landslide susceptible area in Dehradun City
- There are few sugar industries in Dehradun near Doiwala. Sugar industries generally generates some effluents and often they are untreatably discharged in the river or any natural water body.
- There are various Sewage treatment plants that are functional, they are of 68 MLD and 20 MLD capacities. However, STPs are running underutilized capacities. All municipal drains leading to river Suswa and its tributaries should be identified and their interception and diversion to STPs should be prepared. Drains carrying industrial wastewater should not be diverted to STPs.
- The city waste or industrial waste generated must be sent to its relevant location. Biodegradable waste should be utilised for composting and any recyclable waste that is produced must be sent to the registered recycler. Since there are numerous industries in the catchment area of the Suswa River, there are many practices of dumping the waste into the river takes place.
- The urban area has a higher potential for runoff. As a result, precipitation in urban areas is primarily converted to runoff. This reduces the possibility of water percolating deep into the soil and being added to the groundwater of soil moisture. As a result, the basin's water retention power is reduced.

- Urban land use may also influence the timing and magnitude of precipitation inputs to urban watersheds. Urban induced rainfall can be a result of the urban heat island effect (a warming of the local climate due to changes in land cover, drainage, shading, and albedo). The urban heat island can alter convection of air masses in urban areas.
- Urbanization increases the stream's peak follow. As a result, the frequency and severity of floods will increase. Increased flow also causes more soil erosion and, as a result, more sedimentation.
- Changes in land-cover associated with urbanization alter surface and subsurface flow paths and the transport of water and sediment to stream channels, which in turn can alter the channel's geomorphology.
- Increased impervious surface area reduces infiltration and increases stormwater runoff, reducing groundwater recharge.
- Urbanization reduces the water quality of the streams which is one of the sources of water.

6.9 ADAPTATION AND MITIGATION STRATEGIES (S)

- There is an urgent need for restoration of the ecological balance of the entire area comes under the Doon Valley with addressing community demand while not destroying the natural ecosystem.
- Various strategies for the conservation of forests and awareness to people, which plays a vital role in maintaining a proper balance of environment need to be proposed.
- Boundaries need to be modified and finalized for the reserved forest areas as per the current requirement.
- Strick actions through sector specific policies, technology enhancement and awareness need to be taken for pollution control in the region.
- There are few sugar industries in Dehradun near Doiwala. Sugar industries generally generates some effluents and often they are untreatably discharged in the river or any natural water body. This practice must be restricted and regulation standards prescribed under Environment Protection Rules, 1986 should be strictly complied. The effluent must be encouraged to be treated and utilised for other purposes like irrigation. There are about 2 GPIs and 76 industries that are located in the catchment area of Suswa River.

6.10 RECOMMENDATION FOR THE HILLY AREA ZONE DEHRADUN

Dehradun Hilly Area Zone Boundary is demarcated in the proposed landuse Map – 2041. The zone is further classified under three broad catogary: (Refer to Figure- 13)

E-1: Moderate Slope Zone: (0° to 29°)

E-2: Steep slope Zone (30° to 44°)

E-3: Intensive slope Zone (45° and above)

E-1: Moderate Slope Zone 1: (0° to 29°)

Zoning shall be permitted as per assigned landuse in the demarcated zone. Activities permitted in respective zoning regulations of pain area shall prevail. The notified “**Building Bylaws for Hilly Area**” shall be followed while applying for the building permission with concerned authority.

The Authority may have a provision of special unit force to monitor any unauthorised construction in such environmally fragile and protected area. Already constructed unauthorised buildings/structures shall be demolished or levied with extra/premium compounding fees decided by the authority.

E-2: Steep slope Zone 1 (30° to 44°)

Zoning shall be permitted as per assigned landuse in the demarcated zone (**Steep Slope Zone Map**). Activities permitted in respective zoning regulations of pain area shall prevail.

Any New construction shall be controlled through FSI, Ground Coverage and Building Height in the demarcated **Steep slope Zone**. The land under this zone should submit the certified copy of contour maps from survey of India or other competitive government body. Such Certificate should claim that slope is within the specified range category (**30° to 44°**) while applying for the building permission. The authority should restrict **FAR upto 0.2, Ground Coverage maximum up to 20% and Maximum Building Height up to 3.0 meter (two Floors)** while other regulations related to buildings shall be followed as per notified “**Building Bylaws for Hilly Area**”. The FSI on premium/purchasable FSI shall not be allowed in any such regulated/protected zone.

E-3: Intensive slope Zone (45° and above)

No development should take place in the intensive Slope Zone

6.11 RECOMMENDATION FOR THE FAULT LINES IN DEHRADUN REGION

Since, Dehradun falls in zone-4 and zone-5, therefore, there should be no development within 50 Meters from the center line of the fault line (Total Buffer area should be 100 m). The map below presents the buffer of 100m from the fault lines in Dehradun.

Figure 6-10 Buffer of Fault Lines in Dehradun



Source: Geological Survey of India

7 TOURISM AND HERITAGE

7.1 INTRODUCTION

The travel and tourism industry has emerged as one of the world's largest and fastest growing industries as stated in report named Tourism highlights 2013, prepared by United Nations World Tourism Organization (UNWTO). In the current scenario, the tourism industry plays an important role in the Indian economy, contributing to the country's socioeconomic development.

Uttarakhand is a natural adventure, cultural, religious, and wildlife tourism haven. The state is well known for its diverse natural resources and natural beauty, as well as its rich historical and cultural heritage. The snow-capped peaks that surround that state leave a lasting impression on those who visit, connecting their soul to the aesthetic beauty. According to a report published by the Uttarakhand Ministry of Tourism, the following circuits were identified based on tourist priority destinations at state level



- Dehradun- Mussoorie – Dhanaulti – Kanatal – Rishikesh – Haridwar -Dehradun.
- Adi Badri- Simli -Karnaprayag – Chamoli – Pipalikoti – Vradh Badri – Joshimath – Bhavishya Badri -Yogdhyan Badri – Tapovan- Malari -Niti Village.
- Nanakmatta – Tanakpur- Purnagiri – Champawat – Lohaghat – Abbot Mount -Pithoragarh – Jul Jibi – Madkot – Munsiyari - Shyama devi – Kam kot -Bageshwar -Takula -Almora – Leading to Vanasur

However, the state is developing steadily in the various economic sectors. Tourism sector is emerging as a key generator of revenue for the state.

Dehradun, the state's capital and one of the state's major tourism destinations, as well as the district headquarters, attracts a large number of tourists each year, with many of them stopping here on their way to Mussoorie and other destinations such as Dhanaulti and Ponta Sahib. The weather in the city is pleasant all year. Even in the summer, it is hot during the day, but it is pleasant for tourists in the morning, evening, and night. The Forest Research Institute, the only institution of its kind in Asia, is located here and is world renowned for its forestry research. In addition, the headquarters of important institutions such as the Oil and Natural Commission, the Survey of India, and the Military Academy are located here. The Gurudwara built by Guru Ram Rai during the reign of Aurangzeb in the town's Dalanwala neighbourhood is a revered religious site. Other noteworthy locations include the Robber's Cave, located approximately 8 kilometres from Dehradun city. The cave is a natural picnic spot surrounded by hills where water disappears from view and reappear a few yards later as a stream. The city has many beautiful rest houses and good hotels where tourists can stay. For many years, it was one of the most well-known educational institutions in northern India. Dehradun is suitable to visit at any time but ideal duration to visit is from march to June and October to December. Summer temperature peaks at 36°C and the minimum temperature is 5°C in winters.

This chapter Illustrates the tourism profile of the Dehradun Planning Area along with Issues the potential of the same. Future requirements based on proposed population has also been worked out to get a better clarity about the various infrastructure requirement in the future.

7.2 HERITAGE

Dehradun has a number of historical attractions, such as time-honoured buildings, monuments, palaces, and parks. The Archaeological Survey of India (ASI) lists 42 historical monuments protected by the Dehradun Circle. Six of the 42 monuments are in Dehradun District, including the Inscribed Rock Edict of Asoka (Kalsi), Lakhamandal, Famous Sacred Mahasu Temple, Ancient Site (Jagatgram), Excavated Remains of Ancient Temple Veerbhadra, and Khalanga War Memorial. Besides the Centrally protected monuments, there are 47 monuments protected by the Government of Uttarakhand, but none are in Dehradun.

7.2.1 Build Heritage

Old Rajpur still remains a place that reminds Doonites of their city's history. Boasting of old homes built during the British era, which still stand tall in the area, Old Rajpur has become a hotspot for city's photographers. The Canaught Place at Chakrata road is another remnant of the built heritage in the town where the building façade is a representation of the British architecture.

Cultural Heritage

Dehradun has 'Pahari' culture. Folk dance, music and festivals are a huge part of Uttarakhand culture. The land is blessed with the beauty of the Himalayas and ancient temples. The typical Hindu festivals such as Diwali, Holi and Navratri are celebrated here with much zeal. The ancient temples are a major tourist attraction in Dehradun. People who have moved to metropolitan cities from Dehradun visit these temples for religious reasons as well. Due to their high altitudes, many tourists visit ancient temples for work ship and trekking purposes, such as Bhadraj temple in Dehradun. Dehradun has a significant Hindu population, particularly from the Garhwali community. They are heavily involved in cultural activities such as temple visits, which help to promote cultural tourism on a national and international scale. Dehradun is surrounded by well-known old Hindu temples, the majority of which are dedicated to Lord Shiva and attract visitors of all ages, genders, and religions for spiritual and recreational activities. A large crowd gathers to participate in cultural activities such as pooja and aartis.

7.2.2 Fairs and Festivals

Due to the city's Hindu dominance and rich Hindu culture, Dehradun's temples host numerous fairs and festivals. These fairs are religious in nature, and people of all ages enjoy the exhibition of rich cultural heritages during these festivals like tribal dances, community inclusion, and traditional musical prayers, which are usually held on the parade ground. These activities not only serve as a venue for tourist activities, but they also help to foster a sense of social community among the general public. Muslims and Sikhs are other religious communities who contribute to the population, they also celebrate their festivals according to their rituals.

The Dehradun Planning Area hosts the Tapkeshwar Fair, Jhanda Mela, Bissu Mela, Holi, Kumbh (every 12 years), and ArdhKumbh (every six years). This has a substantial impact on the number of tourists who visit Dehradun and the surrounding region or tourist circuits.

7.2.3 Handloom and Handicrafts

Because of its proximity to forests, the city is famous for its handcrafted wooden items such as key chains, decorative objects, doors, nameplates, and so on. Local traditional attire and ornaments, mostly worn by Garhwali and Kumaon women, are also visible in the markets. Some of the famous trade fairs that take place in Dehradun are the Handloom Mela, Pashu Mela, Krishi Mela, Tech Fair, Winter Carnival,

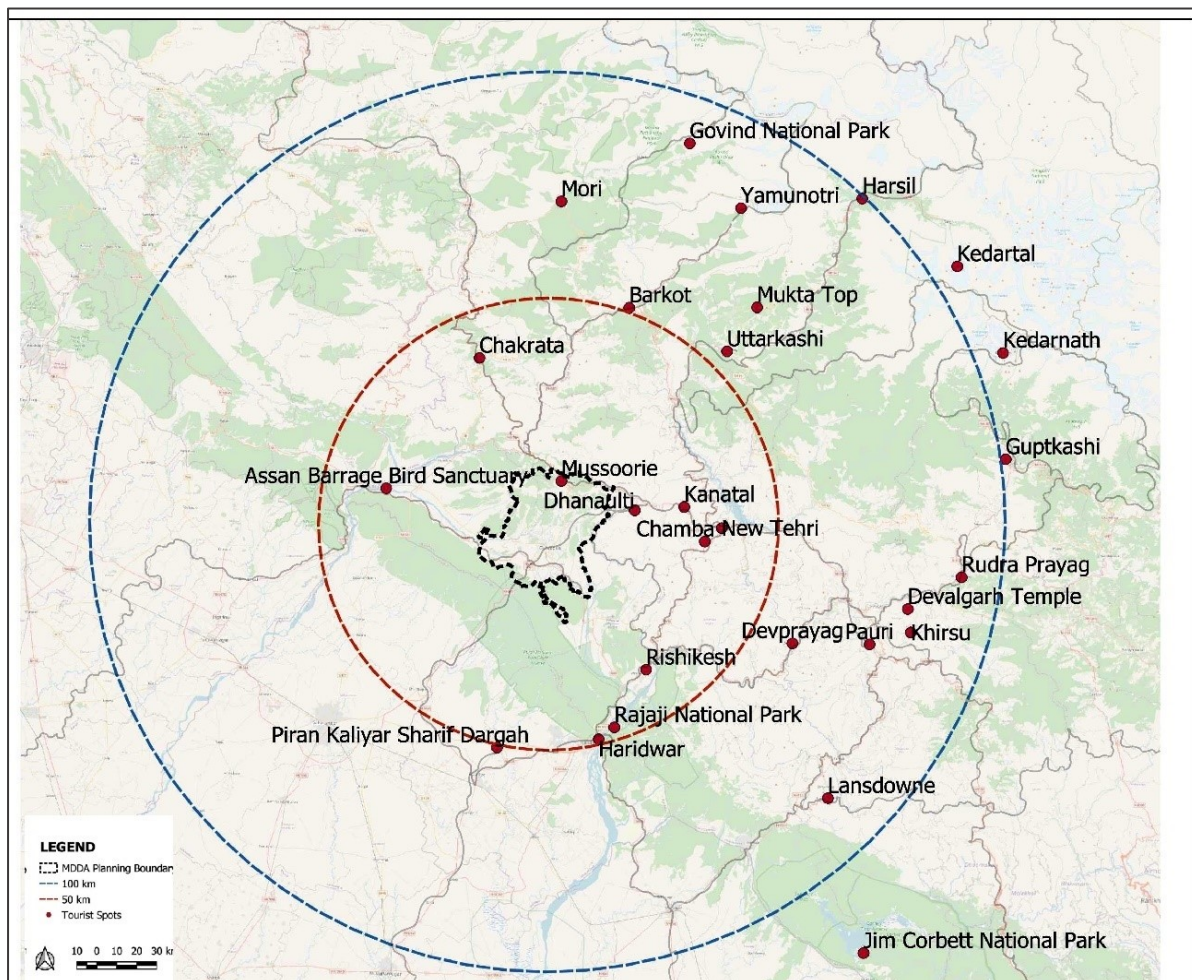
7.3 TOURISM SCENARIO

Dehradun is located at an elevation of 2100 feet above sea level in the Shivalik Ranges. The Ganga River flows east and the Yamuna River flows west of Dehradun. A large number of tourists visit the area each year. Dehradun's pleasant weather and natural surroundings have made it a popular tourist destination. It also serves as a gateway to some of the most beautiful destinations in Uttarakhand, including Mussoorie, Nainital, Haridwar, Auli, and Rishikesh.

7.4 MAJOR TOURIST SPOTS IN DEHRADUN REGION

At the regional level, there are 32 tourist attractions within 100 kilometers of Dehradun. The map below depicts the tourist attractions within 50 and 100 kilometres of the study area. Religious sites, adventure destinations, and wildlife sanctuaries are among the tourist attractions. Assan Barrage Bird Sanctuary, Mussoorie, Rishikesh, Chakrata, Dhanaulti, Chamba, New Tehri, Haridwar, Rajaji National Park, and Piran Kaliyar Sharif Dargah are all within a 50-kilometer radius, while places like Badrinath Temple, Barkot, Devalgarh Temple, Devprayag, Gangotri, Gangotri National Park, Ghangaria, Govind National Park, Most of the tourist places are well connected thorough national, state highways and Ropeways.

Map 7-1 : Tourist Places at regional level



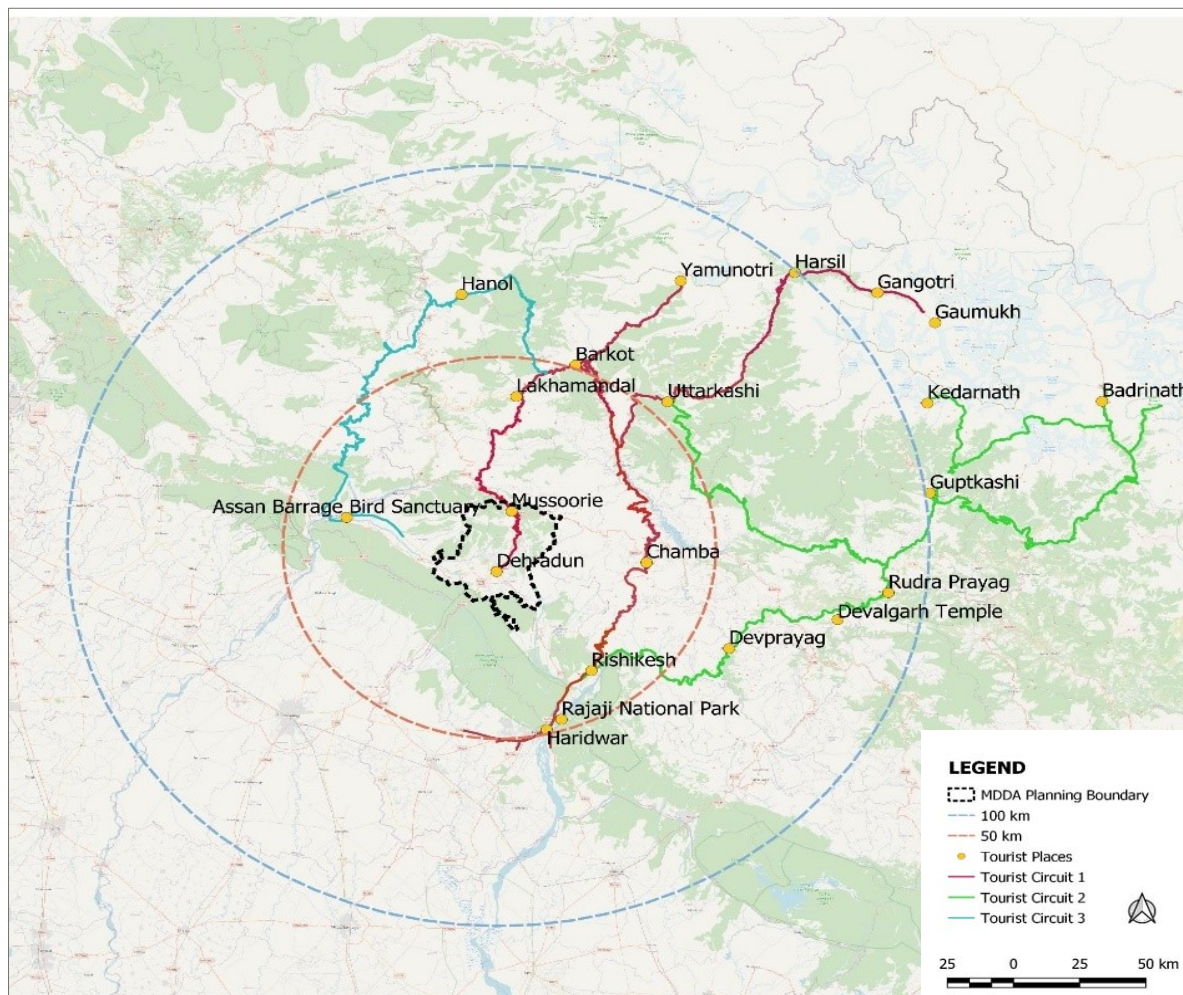
7.5 TOURIST CIRCUITS

Beginning with Dehradun, there are three district circuits, the majority of which serve religious purposes.

- Dehradun–Yamunotri–Gangotri–Gaumukh–Haridwar (Circuit 1 - Red line):** This is 6 days circuit which covers 7 places namely: Dehradun, Barkot, Yamunotri, Harshil, Gangotri, Gaumukh and Haridwar.
- Dehradun–Yamunotri–Gangotri–Kedarnath–Badrinath–Haridwar (Circuit 2 – Green Line):** This circuit is of 10 days and the longest one which starts from Dehradun and covers 10 places namely: Dehradun, Yamunotri, Barkot, Gangotri, Guptkashi, Kedarnath, Badrinath, Rudraprayag, Rishikesh and Haridwar.

3. **Dehradun to Lakhamandal (Circuit 3 – Blue Line):** This circuit is of 4 days and the shortest one which covers 5 tourist spots namely: Dehradun, Mussoorie, Lakhamandal, Hanol and Assan Barrage.

Map 7-2 : District level tourist circuit



7.6 MAJOR TOURIST PLACES IN PLANNING AREA

Every year, a large number of tourists visit Dehradun, the district's headquarters, many of them en route to Mussoorie. In terms of tourism attractions, Dehradun and its surroundings have a number of places worth seeing. The following are some of the most popular tourist attractions in Dehradun:

1. Robbers Cave

Robbers Cave is a favorite picnic spot for young couples and fun-loving enthusiasts. Located near Anarwala village at 8 km from Dehradun city Centre. The Guchu Pani Robbers Cave in Dehradun has become one of the primary attractions in the city, owing to its proximity to the other attractions in the city. Visitors often visit Robbers Cave to enjoy cold streams of water within the natural beauty of caves. Robbers Cave is a 600 m elongated, naturally formed cave. A river passes through this cave making this place a perfect picnic spot for family and friends. The weird and wonderful thing about this place is that a stream of



water miraculously appears in the Robbers Cave and vanishes under the ground, and reappears a few yards further. It is a very pristine and peaceful place and hence intrigues several tourists.

2. Shahastradhara

Shahastradhara Dhara, which translates as "thousand-fold spring," is 11 kilometres from Dehradun. The location is ideal for a picnic and is popular with visitors. The scenery from the Baldi River and the caves is spectacular. The water falls about 9 m. here and is a scenic beauty to enjoy with lime incrustation. Particles accumulated over time have formed a projecting ledge and a sort of cave from which a constant shower fall. A sulphur spring is also nearby, where visitors frequently bathe. Its water is said to be medicinal and to cure skin infections.



3. Maldevta Temple

Mal Devta, a surreal place besieged by dense thicket and the ecstatic Song River, is one of Dehradun's most popular tourist attractions. Bathing in the water fall is a favourite acidity at this tourist sport. The tranquil surroundings and the gurgling sound of the river make this a popular destination for both domestic and international visitors. The tourist attraction is located in Shripur, Dehradun, and is 18 kilometres from ISBT Dehradun.



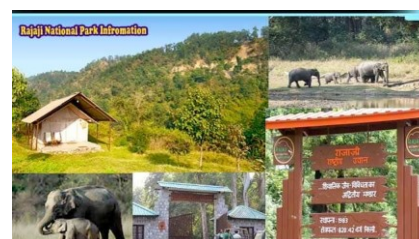
4. Doon Zoo (Malsi Deer park)

The Zoo is located 10 kilometres from Dehradun, en route to Mussoorie, a beautifully developed tourist destination located at the foothills of the Shivalik range. It is a mini-zoological park with a children's park surrounded by beautiful natural surroundings. The attractive environment, as well as the availability of refreshments, make the location an ideal sight-seeing and picnic spot. The park is part of the Malsi Forest Reserve and is Dehradun's second-best wildlife attraction after Rajaji National Park.



5. Rajaji National Park

Rajaji National Park is named after the famous freedom fighter and first governor-general of India- the late Sri C. Rajopalachari. The total area of the Rajaji National Park is spread over 820.42 km sq. Rajaji National Park is spread over the Pauri Garwal, Dehradun and Saharanpur districts of Uttarakhand. Many tourists – national and international, visit the sanctuary for safari, accommodations in hotels and resorts and other tourism activities.



6. Clock Tower and Paltan Bazaar

The Clock Tower (also known as the Balbir Clock) is a historic and well-known monument in the heart of Dehradun. Before independence, it was built in memory of Lal Balbir Singh. The tower attracts both locals and visitors due to its uniqueness. The monument can be found in Paltan Bazaar, the city's well-known local market. Paltan Bazaar is one of Dehradun's most crowded markets due to its diversity in shops and restaurants.



7. Laxman Siddh

The Laxman Siddh Temple is well-known as the cremation site of Swami Laxman Siddh, the holy saint. On the Haridwar/Rishikesh Road, it is 12 kilometres from Dehradun. The temple attracts a large number of visitors, especially on Sundays, due to its easy accessibility. The Laxman Siddh Temple, located in a picturesque setting surrounded by dense forest, is thought to be the same location where Lord Laxman, Lord Rama's brother, underwent repentance after slaying the demon king Ravana. At this location, Saint Swami Laxman Siddh performed penance and was cremated. (Subdivisions: kalu, mandu, manak)



8. Tapkeshwar Temple

Tapkeshwar Shiv Temple is an ancient Hindu temple located in the Garhi Cantonment Area on the banks of a rivulet. The temple is easily accessible by car and is only 5.5 km from the city bus stop. A Shiva Linga in the main complex is said to grant the wishes of all who seek the Lord's blessings. Tapkeshwar gets its name from water droplets that fall on the Shivaling in the shrine. People flock to the Shivratri fair in large numbers to pay their respects to the deity.



9. Laxman Singh Mandir

Laxman Siddh Temple is well-known as the cremation site of the holy Saint Swami Laxman Siddh. It is 12 kilometres from Dehradun on the Haridwar/Rishikesh Road. Due to its easy accessibility, the temple attracts a large number of visitors, particularly on Sundays. Laxman Siddh Temple, located in a scenic environment surrounded by dense forest, is believed to be the same location where Lord Laxman, brother of Lord Rama, underwent repentance after slaying the demon king Ravana. Saint Swami Laxman Siddh performed penance and was cremated at this location.



10. Sai Mandir

Sai mandir is one of the famous and precious temples at Rajpur road, Dehradun city. The idol of Sai baba is placed in the middle of the temple. Many devotees- locals and outsiders visit for religious practices like aartis and pooja. These religious practices are performed every day. Devotees can easily reach the temple through public transport like autos and rickshaws. It is at the range of 9 km from the city's railway station and 35 km from Jolly grant airport, Dehradun city.



11. Santla Devi Temple

A 45-minute hike takes you to the top, where the temple of Ma Santala Devi is located. In the months of March and June, it is preferable to go early in the morning between 6 and 8 a.m., when the temperature is normal. From the bottom of the hill to the temple, there are no sheds, shops, or other structures. As a result, when the sun is rising, it may be difficult to climb. Yes, there are some benches in between for a short rest. Simply climb slowly while taking in the scenery. It is very calm at the top.



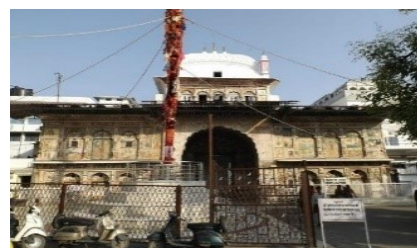
12. Buddha Temple - Mind Rolling Monastery

Buddha Temple is a Tibetan monastery, also known as Mindrolling Monastery, founded in 1965 by His Eminence the Kochen Rinpoche and a few other monks to promote and protect Buddhist religious and cultural understanding. It is located on Rajpur Road, near the Sai Darbar Temple, and is a large and colourful temple dedicated to Lord Buddha. This monastery is located near ISBT, in the city's Clement town area, and is visited by tourists from all over the world. This magnificent Buddhist holy place Buddha temple is approximately 220 feet tall and has five floors that house statues of Buddha and Guru Padmasambhava.



13. Jhanda Sahib Gurudwara

The Gurudwara is named after the elder son of the seventh Sikh Guru, Guru Har Rai. Guru Ram Rai is the founder of Dehradun. An annual "Jhanda fair" is held at this gurudwara near Holi when lakhs of people visit the place. It is said that the Jhanda, or the flag itself, mounts and stands erect during the fair. The gurudwara building shows some Mughal architecture. The Gurudwara is near tilak road, Dehradun.



14. Forest Research Institute

The Forest Research Institute (FRI) is a premier institution in the field of forestry research in India and is an institute of the Indian Council of Forestry Research and Education. FRI was founded in 1906 as the Imperial Forest Research Institute and was later renamed Forest Research Institute and Colleges. It is one of the oldest institutions of its kind and is located in Dehradun, Uttarakhand. The FRI and College Area campus is a census town located between Kaulagarh in the north and the Indian Military Academy in the south, with the Tons River serving as its western boundary. The main building is approached through a collonaded porch built on a raised brick plinth about three feet high. The grand structure of the FRI houses a Forestry Museum and contains some interesting relics related to the history of forestry in India. What adds to the allure of the campus are the arboretums or tree gardens surrounding it.



15. Indian Military Academy

The Indian Military Academy (IMA) is an army officers' training academy set up in 1932 to train officers of the Indian Army. Also called Dormer Hall in the past, the Indian Military Academy stands out for its exceptional history of producing defence officers of repute and also for the architectural elegance of its buildings. The Chetwode Hall, named after the then Commander-in-Chief Sir Philip Chetwode, is a masterpiece of Greco-Roman architecture and is the most significant building, architecturally and



functionally, on the campus. The Hall also has a War Museum with several memorabilia of the wars fought by the Indian Army.

16. Wildlife Institute

The institute is located in Chandrabadni, close to the southern forests of Dehradun. The total campus area is 180 acres of forest and 80 acres of operational facilities. WII carries out wildlife research in areas of study like Biodiversity, Endangered Species, Wildlife Policy, Wildlife Management, Wildlife Forensics, Spatial Modeling, Ecodevelopment, Ecotoxicology, Habitat Ecology and Climate Change. WII research facility, which includes Forensics, Remote Sensing and GIS, Laboratory, Herbarium, and an Electronic Library



7.7 TYPES OF TOURISM

7.7.1 Eco-Tourism and Adventure Tourism

In Uttarakhand, Eco-Tourism and Adventure tourism includes activities like Bungee Jumping, Jungle Safari, Mountain Biking, Paragliding, River Rafting, Skiing, Stargazing, Trekking and Water Sports. Most of these activities are performed at places as follows:

- Bungee Jumping - Rishikesh
- **Jungle Safari** - Corbett National Park and Rajaji National Park
- **Mountain Biking** - Chopta, Dehradun and Sattal
- **Paragliding** - Nainital, Mussoorie and Bhimtal
- **River Rafting** - Rishikesh, Devprayag and Corbett National Park
- **Trekking** - Sunderdhunga, Dodital Yamunotri, Kalindi Khal, Binsar, Roopkund, Devi Darshan, Kalsi Lakhamandal, Kedarkantha, Dayara Bugyal, Kedarnath-Vasukital, Auli to Gorson Bugyal, Pindari Glacier, Satopanth Lake, Chopta-Chandrashila, Nag Tibba, A Grand, Ndia's Grandest Meadow, Gangotri, Gaumukh to Tapovan, Kafni Glacier Trek and The Valley of Flowers.
- **Water Sports** - New Tehri and Nainital
- **Skiing** - Auli
- **Stargazing** - Kausani, Devprayag and Bhimtal
- **Yoga and Healing activities**- Patanjali ashram in Haridwar is famous for its medical and healing facilities like Yoga, weight loss journey, ayurvedic treatments, leisure
- **Maldevta Temple**- Dehradun is famous for leisure activities due to the presence of water
- **Asan barrage**- Famous for recreational activities like bird watching, boating etc. and educational purposes like- research.
- **Bhadraj Temple**- Dehradun, Tourists visit for religious purposes as well as for leisure activities like trekking.

The study area does not cover many places of Eco and Adventure tourism; hence such activities must be promoted within MDDA.

7.8 TOURIST CHARACTERISTICS AND VOLUME

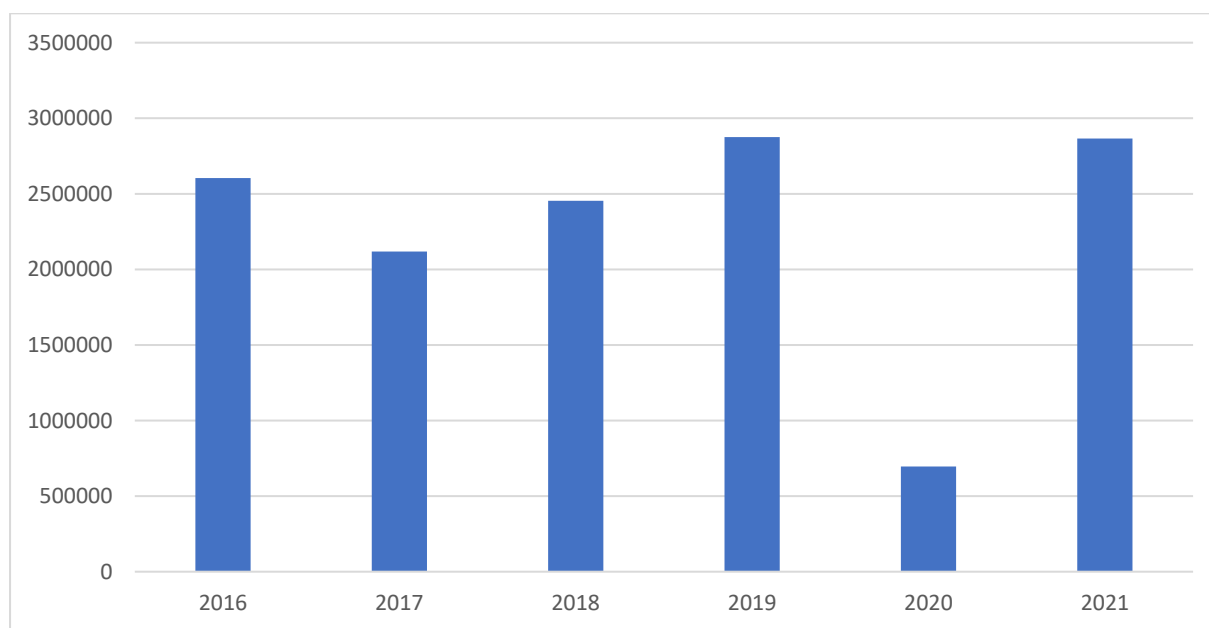
7.8.1 Seasonal Variation and Trends

The Tourism Department organises and manages the journey to the four Shrines (Char Dham) beginning in March and continuing until October-November. Dehradun receives a large number of tourists during the summer season because it serves as a major road corridor connecting cities such as Delhi, Ambala, and Saharanpur to the mighty Himalayas. During the season, bus services and taxis are in high demand, primarily from Dehradun and Rishikesh. The journey is not operational during the winter season due to the Tourism Department's approval. However, proposals for the Char Dham pilgrimage during the monsoon season have now been accepted. The reasons are inconvenience and mismanagement brought on by an uncontrollable influx of

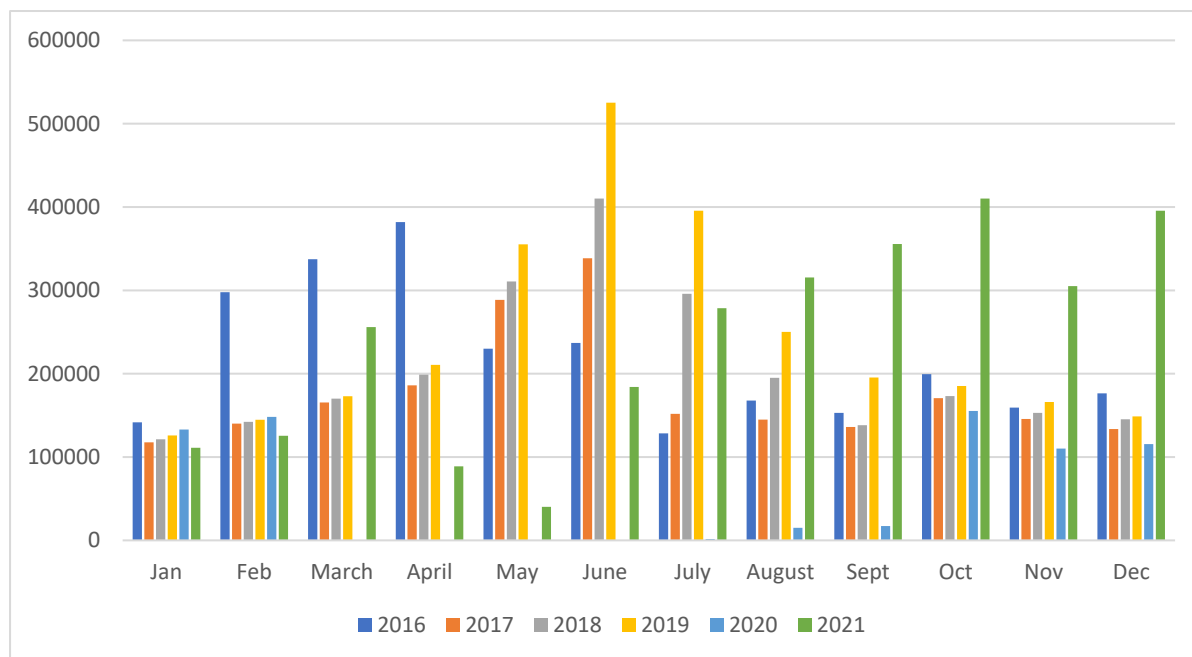
tourists during the season. The Tourism Department has planned a journey during the winter season to maximise the potential of nearby areas by inviting as many tourists as possible. This concept aims to increase employment opportunities for seasonal workers while also reducing migration from rural to urban areas.

Dehradun experiences significant tourist inflow during the summer, spring, and autumn seasons. This could be due to the Indian population's desire to enjoy the pleasant weather during these three seasons. Although, inflow during the winter is not less because it provides a great joy of Christmas in pleasant weather. The presence of several prestigious institutes in Dehradun heralds the arrival of students and their families who wish to study in those institutes during the admissions period, which is July-August. Students from various states in India and other countries come to pursue academic excellence.

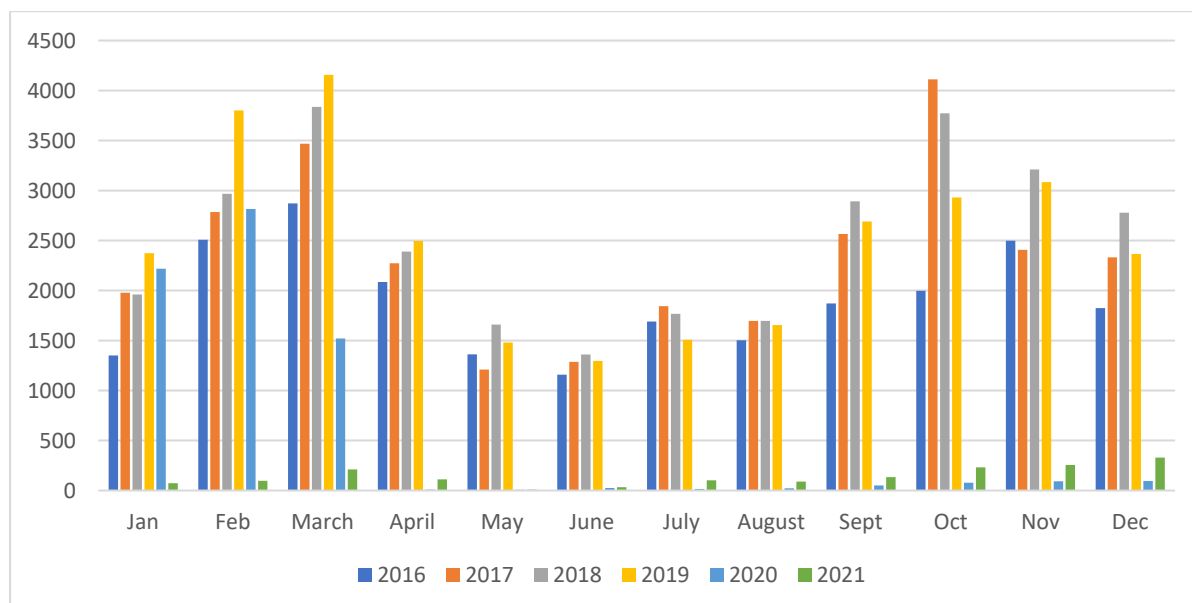
Figure 7-1: Tourist Inflow from 2016 -21 in Dehradun District



The table shows the total number of tourists who arrived in Dehradun District from 2016 to 2021, with 2019 having the highest inflow; according to the Tourism Department, 2019 is a covid period with the highest number of inflows. Outsiders are considered tourists in 2019 who come to their home in Uttarakhand from different states and countries, and their volume was very high; as a result, this year has a major inflow, and later once the lockdown was lifted the people started coming for site visits in Dehradun district.

Figure 7-2: National Tourist Inflow from 2016 -20 in Dehradun District


This graph depicts the number of national tourists visiting the Dehradun district. May, June, July, and August are the most popular months for tourists, as the rest of India experiences hot weather. Uttarakhand has a mild climate, so tourists visit during these months.

Figure 7-3: International Tourist Inflow from 2016 -20 in Dehradun District


Major international tourist arrivals are in the months of January, February, March, April, October, November, and December, they come for camping and hiking in high altitudes, but their flow is less than national tourists.

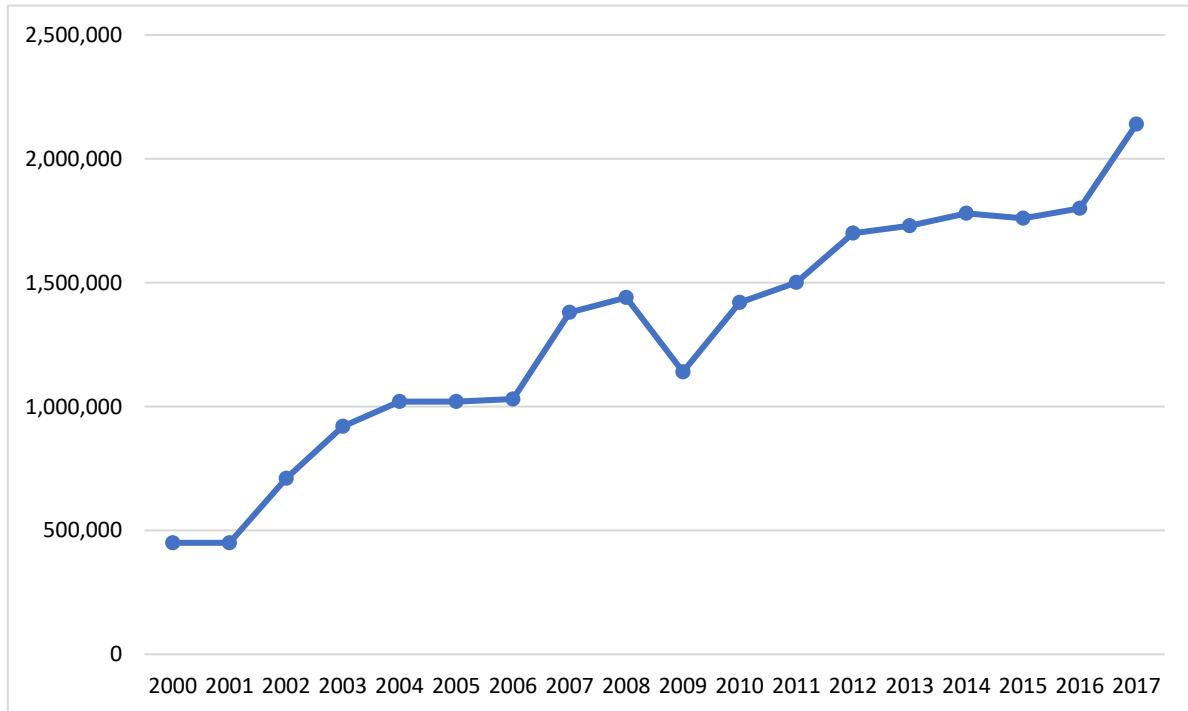
7.8.2 Tourist Floating Population

The presence of significant historical, religious, and natural symbols in Dehradun is the main reason for the increase in tourist population. Road infrastructure improvements have resulted in a significant increase in tourist flow, but foreign tourists remain scarce. The insufficient infrastructure has been unable to keep up with the growing influx of tourists. As a result, despite the potential, the number of tourists who stay is much lower. More than 75% of tourists come to Dehradun to participate in religious festivals in the Doon Ghati Area, 22% are general tourists who eventually

continue their journey to nearby spots after staying in Dehradun for about 2 days, and the remainder come to Dehradun because of the presence of prestigious institutes.

According to the Comprehensive Mobility Plan 2019, the following section discusses Dehradun City Tourist Statistics. According to the Comprehensive Mobility Plan 2019, the annual tourist flow in Dehradun in 2017 was approximately 21.4 lakh. There are 98% domestic tourists and 2% foreign tourists among them.

Graph 7-1: Yearly Tourist Flow in Dehradun city

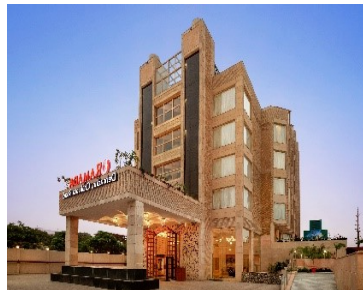


Source: Comprehensive Mobility Plan – 2019

7.9 TOURIST ACCOMMODATION FACILITIES

According to Uttarakhand Tourism Department, the total number of registered accommodation units in Uttarakhand such as Hotels/ Resorts/ Home stays/ Guest houses in Dehradun are 805 where there are 140 home stays, 663 hotels/resorts/guest houses and 2 government guest houses.

Figure 7-4 5 Star Hotels of Dehradun City



According to the 'Comprehensive Mobility Plan - 2019', the total number of hotels in Dehradun City is around 116, with a total of 5537 rooms. With two people per room, the total number of tourists staying in hotels is 11074. According to projection studies conducted in this plan for 2021, approximately 13,000 tourists visit Dehradun daily. As a result, proper planning and lodging facilities are required in the Dehradun Planning Area.

7.10 TOURIST POLICIES AND PROGRAM(S)

The following are the Tourism Policies, Programs and Acts in Dehradun, which are State and centrally applied:

7.10.1 UK Tourism Development Act 2001

This act was passed to Formulate policies and strategies for tourism development in Uttarakhand. The Government of Uttarakhand shall, by notification in the official gazette, establish a body by the provisions of this Act, which shall be called the Uttaranchal Tourism Development Board. It is used to prepare plans for developing and strengthening tourism-related infrastructure in the State, ensuring inter-departmental coordination. It formulates a strategy for mobilising private sector participation and investment in the tourism sector and promotes the improvement of facilities for visitors to Uttarakhand by developing it as a global tourist destination.

7.10.2 Veer Chandra Singh Garhwali Self Employment Scheme

This policy was notified on 1st June 2002 to provide people with employment through tourism activities and to encourage public participation in tourism development. It includes developing bus-taxi transport services, establishing fast-food centres, motor workshops/garages, accommodation facilities, trade centres for local handicrafts and meditation centres. It has achieved 3331 employments while investing Rs. 5967.42 lakh through this policy in the state of Uttarakhand till 2011.

7.10.3 UK Tourism Policy 2018

The main aim of the policy is to create Uttarakhand as a global tourist destination that is safe and sustainable and which includes world-class tourism products and services that could unleash the true tourism potential of the State. The government of Uttarakhand has decided to develop '13 District 13 Destinations'. This important initiative is targeted toward the holistic development of the state and will take tourism to the last mile and far-flung yet beautiful districts of Uttarakhand.

7.10.4 Paying Guest Scheme

- For plain districts, 25 per cent of the cost or maximum Rs 7.50 lakh basic subsidy and maximum interest subsidy benefit of Rs 1.00 lakh/year for five years.
- For hilly districts, 33 per cent of the cost or maximum Rs 10.00 lakh basic subsidy and maximum interest subsidy of Rs. 1.50 lakh/year for five years.

7.10.5 Deendayal Upadhyaya Griha Awaas Home Stay Policy

To improve the rural economy in the state and provide a livelihood to the people, the Uttarakhand government has given a green signal to the ambitious homestay scheme in the state. It is to promote balanced regional development through Hub & Spoke model and to resolve the carrying capacity issues of prominent tourist destinations.

Objectives of the scheme:

- To improve their economic condition by providing self-employment to the local people.
- To introduce tourists to the state's cuisine, culture, historical heritage and traditional / Pahari style.
- Stop migration from the state by creating local employment.
- Target to develop 5000 homestays under Vision 2020.

Benefits of the homestay scheme:

- State assistance will also be provided to the eligible applicants for taking a loan from the bank for setting up the homestay/renovation of the house.
- The amount of SGST will be reimbursed by the department for the first three years on the income received from the homestay.
- A separate website and mobile app will be developed to promote the scheme.
- Homestay operators will be given hospitality training.
- Reimbursement of charges payable on bond deed against the sanction of business loan to thirty lakh rupees.

- Upgradation, furnishing, maintenance in old buildings and construction of new toilets to Rs. 2 lakhs will not require land change.

7.11 TOURISM INFRASTRUCTURE ASSESSMENT

Tourist attractions in the Dehradun planning area have major infrastructure issues, which affect the city's tourist inflow. Because the tourist attractions are in the city, they all have traffic, accessibility, and parking issues. Public transportation does not serve these locations well. Aside from that, the aforementioned tourist destination lacks adequate drinking water, public restrooms, and seating benches. The infrastructure also lacks supervision facilities such as CCTVs, information booths, street lights, and Sign Boards, affecting tourists' social security and services. The infrastructure in tourist areas is not well planned for international tourists in accordance with their needs.

7.12 TOURISM POTENTIAL WITHIN THE PLANNING AREA

Shahastradhara has the potential to become a major tourist attraction; the inflow is higher on weekends and during the holiday season, but most visitors are from the city and stay for only one or two hours. This location has stunning natural beauty that can be enhanced with infrastructure like benches, site viewpoints, a proper sitting area for the elderly, public restrooms, and parking areas. Robbers Cave in the city is also underutilized by domestic and international visitors; however, this location has the potential to be developed as an attraction point, and the caves will attract tourists as infrastructure improves.

There are many smaller tourist destinations and trekking routes that have great potential and can be developed to bring more visitors to the town. Another major area that needs to be improved to attract more tourists is the existing infrastructure at popular tourist destinations. Because the city is home to numerous national-level institutes, medical and educational tourism has the potential to attract both domestic and international students interested in pursuing education, research, and knowledge acquisition. The city has many specialized hospitals where people come from all over India and beyond, including Afghanistan, Iraq, and other middle-income countries, so medical tourism has the potential to generate revenue.

In the south, some of the Rajaji National Park is under the jurisdiction of the city. To attract tourists, some activities such as jungle safaris, camping, and forest walks can be proposed.

7.13 ONGOING AND SANCTIONED PROPOSAL(S)

7.13.1 Dehradun Mussoorie Ropeway Project

An Integrated and Sustainable Transportation Solution for the Twin Cities of Dehradun and Mussoorie to reduce vehicular traffic on the Mussoorie Road, thereby reducing pollution/congestion and travel time in peak season from 2/3 hours to approximately 20 minutes.

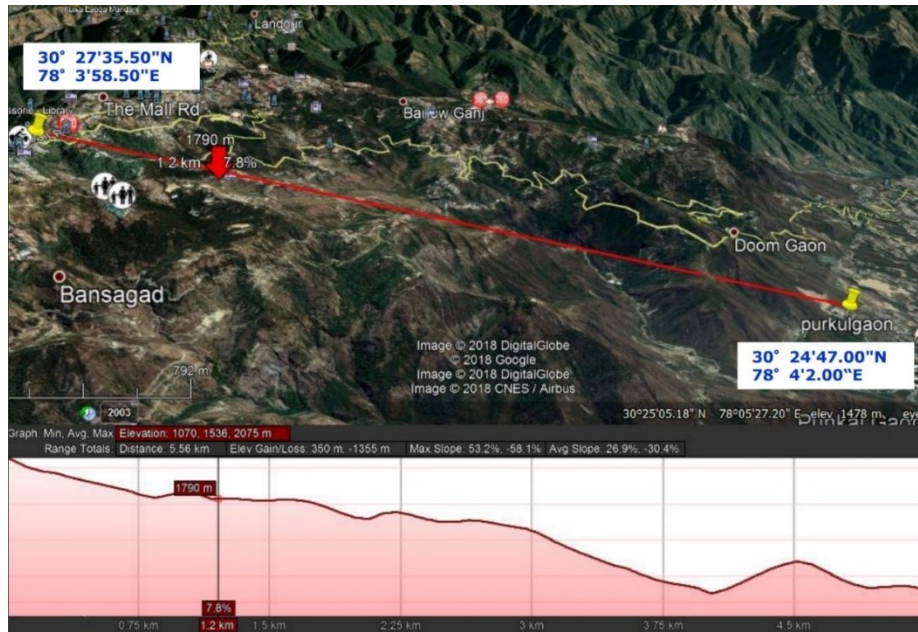
1. Proposed Lower Terminal Point – Purkulgaon

A lower terminal parking facility has been provided on the total plot area of 22,650 sqm with a ground coverage of 15000 sq.m having four floors. There are 1400 – 1500 car parking considering an Equivalent car space of 32 sq.m.

2. Proposed Upper Terminal Point – Mussoorie

There are three blocks and a Ropeway terminal on the upper terminal point where block 1 has a total area of 8,220 sqm with six floors having 43-44 cars per floor (260 in total), and 4th floor above the ground has been proposed as commercial development. Block 1 and block 2 are interconnected with the same ramps having entry-exit points from the Mussoorie Dehradun road. In contrast, block 2 has a total area of 9,160 sqm with 7 floors (all below ground floor) and having car capacity of 35 per floor (240 in total). The third block is new construction on the site with a total area of 12,080 sqm, having 8 floors where 3 floors of the building down the basement have been designated for rehabilitation and relocation purposes from the existing structures.

Map 7-3 : Dehradun Mussoorie Ropeway



7.13.2 Smart Solution in MDDA Park

Many visitors of various ages flock to MDDA Park, drawn in by the park's well-kept gardens and the scenic beauty surrounding it. This opulent park is located in Rajpur, Dehradun. MDDA has proposed a light and sound show in Rajpur Park to beautify the park. This Park was created to preserve the traditional and cultural heritage of Uttarakhand in general, and Dehradun in particular, as part of the Smart City Mission.

7.14 ISSUES AND POTENTIAL(S)

- Opportunities for Regional Connectivity through rail and road with nearby urban centers and tourist places will help to attract more tourists in the future.
- Potential to increase medical tourism through World-class institutes like AIMS and Max hospitals has the potential to increase medical tourism, which will further lead to better-paying tourists, which will increase the accommodations as well as the economy within the city. Medical tourism will also reduce the social- environmental impact like- open garbage disposals on rivers and forests (solid waste management), Pollution of rivers, traffic and congestion, parking issues in commercial areas or hampering the harmony of the city.
- Educational tourism through Dehradun's best private and public educational institutes like Graphic Era, Uttaranchal University, UPES, Doon universities and many more have the potential as well as infrastructure to attract national and international students, which will increase city's economy.
- Increasing tourist activities like adventure camps and cultural promotions to increase the stay.
- Promotion of wildlife sanctuaries and national parks to attract more tourists.
- There are many small tourist locations like temples and trekking routes which can be promoted to attract more tourists in the town.
- Creating local mini tourist circuits of tourist spots will increase the stay of the tourist which will lead to more economic benefits to town.
- Accommodation facilities in Dehradun are not sufficient to cater for the present tourist inflow
- Dehradun receives the seasonal thrust. The important periods of the year are summers, the time of academic admissions, pilgrimage and festival season. This reduces the chances of employment for small industries as they are unemployed during the off-season.
- The majority of visitors to Dehradun arrive in their own vehicles, necessitating parking facilities. According to a survey of tourists, finding parking facilities for vehicles is a major

hassle in town. Inadequate parking is the most significant barrier that tourism service providers face in attracting more tourists.

- Due to a lack of adequate air connectivity, infrastructure and tourism activities, Dehradun lacks high-end tourism with higher revenue potential. Foreign tourist constitutes around 2% of the total tourist flow to Dehradun.
- Lack of public utility and services in tourist areas like- dustbins, and public toilets, causes nuisance and disturbs the city's harmony.
- Lack of public awareness regarding cleanliness and the importance of preserving green spaces causes garbage throwing activities in the rivers, forest areas and open spaces, putting pressure on authorities for cleaning and sanitation.
- Requirement for better tourist transport infrastructure to reduce the impact of traffic, vehicular-pedestrian conflict and congestion caused by private vehicles

7.15 FUTURE REQUIREMENT(S)

Dehradun and Mussoorie are most popular tourist destinations in the country, it attracts tourists from all over the country as well as other countries. To project the requirements for infrastructure (physical and social), it is essential to project the floating population for the horizon year. Sustainable development requires that the capital city is developed keeping in view not only the residential population but also the floating population of tourist.

The current monthly tourist population of Dehradun in 2017 is 1,78,333 (11899 daily – considering 2 days of stay). While average CAGR of Dehradun as of 2017 is 0.95. Considering the Average CAGR 1 and average daily population of 12000, the proposed tourist population of the area is described as:

Table 7-1: Proposed Floating Population – Tourist on a Daily basis

Year	Tourist Flow(Per Day)
2011	12,000
2021	13,255
2031	14,642
2041	16,174

Source: Consultant Analysis

The proposed daily tourist population of the Dehradun Planning Area for 2041 is around 16,174.

7.15.1 Strategies:

- Accommodations must be built and provided as per the tourist flow, especially for overnight stays. The concept of Home Stay, Hostels and Rental Apartments needs to be adopted for the economic development of the region.
- Newer Economy needs to be identified for secured employment.
- Better infrastructure facility needs to be developed in the national park and other tourist destinations to attract more foreign tourists as shown in the pictures below



- Rajaji National Park has the potential to attract more international tourists through better tourism activity's introduction like- adventure activities, infrastructures, promotions etc.
- Potential to attract international tourists through medical and educational tourism.
- Fairs and exhibitions should be promoted more to attract more tourists at larger level.
- Creating local mini tourist circuits of tourist spots will increase the stay of the tourist which will lead to more economic benefits to town.

8 PHYSICAL INFRASTRUCTURE

8.1 INTRODUCTION

Infrastructure refers to the services and facilities necessary for an economy to function. Infrastructure can be classified into two broad categories: 'Hard' Infrastructure and 'Soft' infrastructure. 'Hard' infrastructure refers to the large physical networks necessary for the functioning of a nation, such as Water; Power and Communications infrastructure, whereas 'Soft' infrastructure refers to all the institutions which are required to maintain the economic, health, and cultural and social standards of a country, such as the education system;

Physical infrastructure is critical to the proper operation of any city. This chapter will assist in understanding the current situation as well as issues and potentials in the city's existing infrastructure profile.

8.2 WATER SUPPLY

Dehradun's water supply system was established in 1885. The existing water supply system in Dehradun, which is over 30 years old, is divided into four zones: North zone, South zone, and Pithuwala zone and Raipur zone. The north zone is primarily supplied by surface water sources, while the south, Pithuwala zone and Raipur Zone are supplied by ground water from tube wells located throughout the city. The city's entire water supply scheme is managed by Uttarakhand Jal Sansthan and implemented by Uttarakhand Pey Jal Nigam (UPJN) (UJS).

Providing safe drinking water and basic sanitation contributes to sustainable improvements in people's lives regarding their health and education. A detailed analysis has been done to study the service level of the present water supply scheme and the requirement of the system to serve the future population by understanding the existing water supply system.

8.2.1 Water Supply Sources (Surface & Underground)

Since the beginning of the water supply scheme in Dehradun, different canals have been the primary source of water supply. Dehradun city is supplied with both surface and ground water. In Dehradun, the total volume of water supplied via pumps is 150.25 MLD. There is total 192 Number of major and mini tube wells used to extract ground water. The total Water Supply through it is around 115 MLD. Around 11 surface water resources are being tapped in Dehradun for water supply. The total contribution or withdrawal from all surface water resources is approximately 40.9 MLD

8.2.1.1 Surface Water:

The major source of surface water supply is the river Song. Its minimum discharge is 273 cusecs. The raw water pumping station is located at Rajpur on the left bank of the river Song. Around 11 surface water resources are being tapped in Dehradun for water supply, their location and details are listed as below:

Table 8-1: Details of surface water sources

Sr. No.	Name of Surface Sources	Approximate quantity Available (MLD)	Type of sources
1	Massifall	7.00	
2	Kyarikuli (Upper zone yojna)	5.4	
3	Malsi (Karligarh)	0.28	
4	Kolhukhet	0.54	Spring
5	Jodhi Mini	0.16	Pump
6	Bhitarigarh	0.12	
7	Shivlok	0.34	Pump
8	Nanurkheda	1.15	Pump
9	Bindal	6.75	River

Sr. No.	Name of Surface Sources	Approximate quantity Available (MLD)	Type of sources
10	Bijapur	10	Canal
11	Galogi	9.15	
Total		40.9	

Source: Water Balance Plan of Dehradun 2020

Due to the elevation, surface water is tapped using a mechanical pumping system. Galogi, Massifalls, Bindal River, and Kyarikuli have the highest water discharges among the eleven water resources, accounting for nearly 70% of total water withdrawal from surface water resources. The total contribution or withdrawal from all surface water resources is approximately 40.9 MLD.

In Gov. Supply, the initial water source is rivers and ground water but that water is treated and then supplied to people for consumption. In private supply, the main source of water is ground water and there is no treatment of water so the quality is different from tap water. In Slums, the River water is another major source of water, this water is not treated and some people are directly consuming this water.

8.2.1.2 Ground Water:

Due to the city's reliance on ground water sources for water supply and the increase in hard surfaces caused by urbanisation, ground water percolation and water extraction have decreased significantly. Ground water is available at a depth of 15 to 20 metres into the region prior to the Monsoon. However, water is available at depths of more than 20 metres in Raipur and its surrounding areas. The situation improved after the monsoon. Water will be available at a depth of 15 to 20 metres in Raipur and its surroundings.

8.2.1.3 Tube wells:

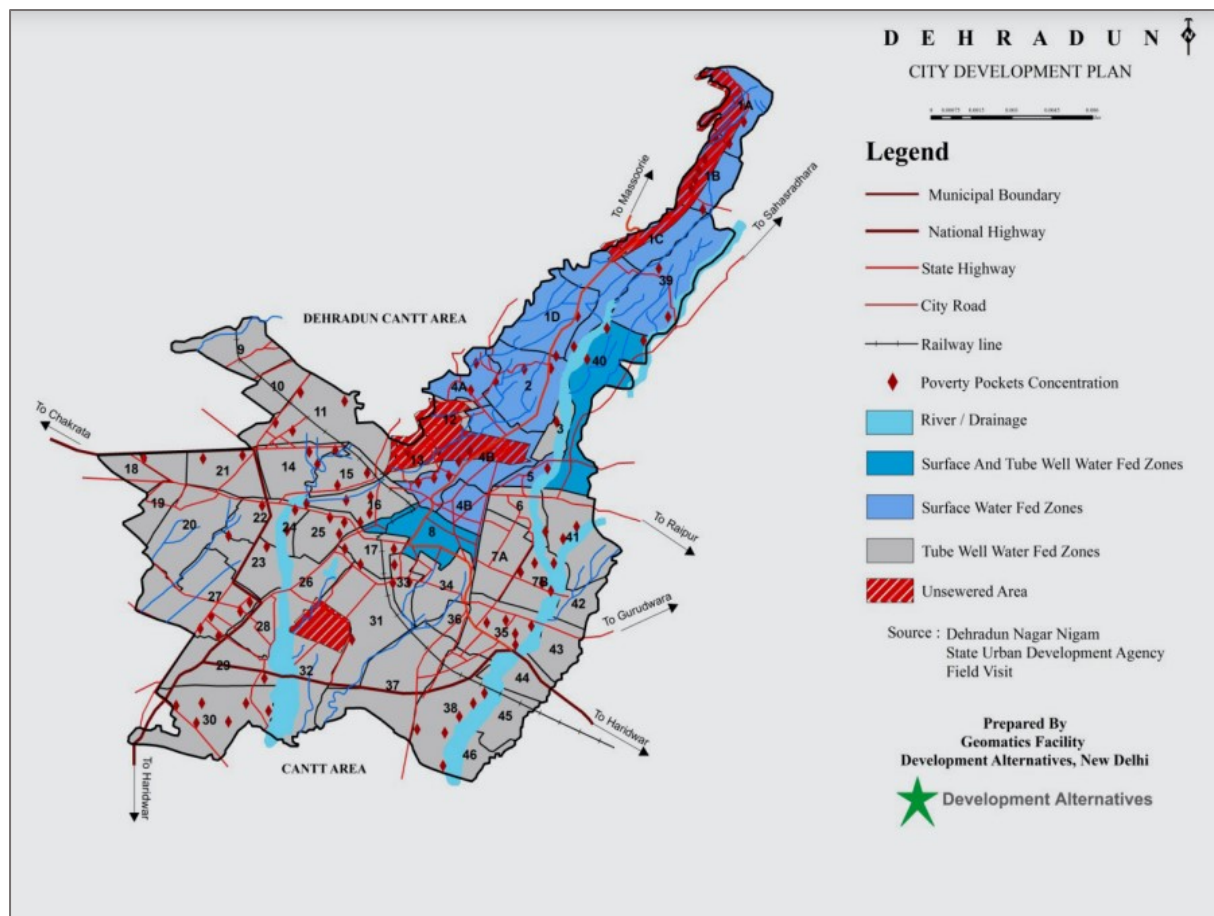
This water supply system is made up of 192 tube-wells located throughout the city. Water is delivered directly to the nearby population. It supplies water to roughly half of Dehradun's total population. The total supply from Dehradun's tube well is 115 MLD.

8.2.1.4 Hand Pumps:

In the city, hand pumps are also in use. The majority of the hand pumps have been bored to a depth of 100 feet. Sewer water leaks can pollute ground water storage and cause outbreaks of gastroenteritis, diarrhoea, and other diseases. Slums and squatter settlements are the worst affected areas in terms of water supply, with only a few public water connections serving the entire locality.

Approximately 289 pumps are installed throughout Dehradun City for ground water abstraction. These pumps are divided into four zones: North, South, Pithuwala, and Raipur. The total withdrawal capacity of these pumps are 150.25 MLD.

Map 8-1: Source of water supply in Dehradun



8.2.2 Groundwater and Surface Water Pumping Station:

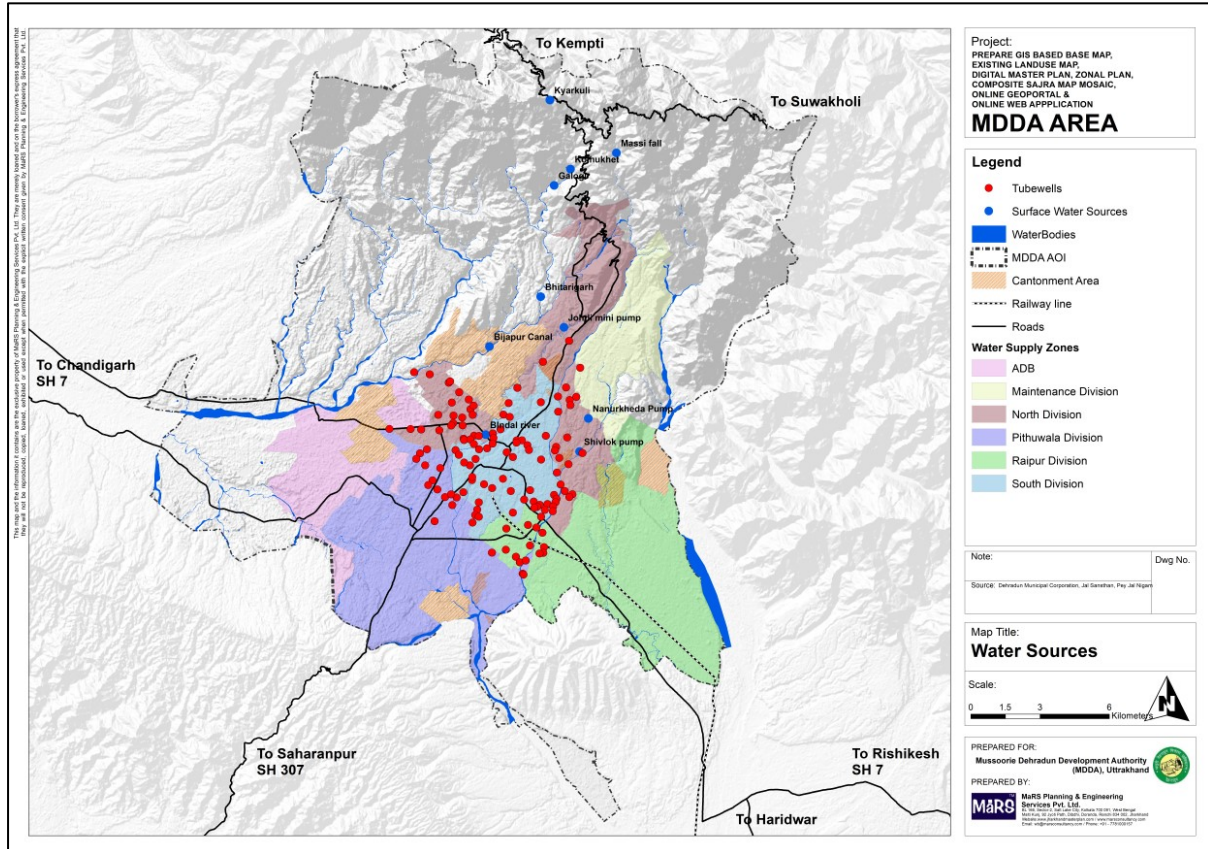
Pumping Stations are located all over the city, transmitting it directly to near OHT or CWR for storage then distributed to the distribution mains then to domestic and non-domestic use. There is total 192 Number of major and mini tube wells used to extract ground water. Out of these, 178 are managed by Uttarakhand Jal Sansthan (UJS) and 14 by Uttarakhand Jal Nigam. Aside from tube wells, approximately 289 pumps are installed throughout Dehradun City for ground water abstraction. These pumps are divided into four zones: North, South, Pithuwala, and Raipur. The South division of Pumps is densely populated. The amount of water pumped in this division is also the highest among all divisions. The location of the pumps and their withdrawal capacity are described further below.

Table 8-2: Withdrawal Capacity of the Pumps under various divisions

Zones	No. Of Pumps	Withdrawal capacity of Pumps
South Division	87	76.308 MLD
North Division	68	29.178 MLD
Pithuwala Division	76	25.464 MLD
Raipur Division	58	19.305 MLD
Total	289	150.25 MLD

Source: Water Balance Plan of Dehradun 2020

Map 8-2: Location of Tube wells within the City Limit



Source: Water Balance Plan of Dehradun City, 2020

8.2.3 Per Capita Water Supply

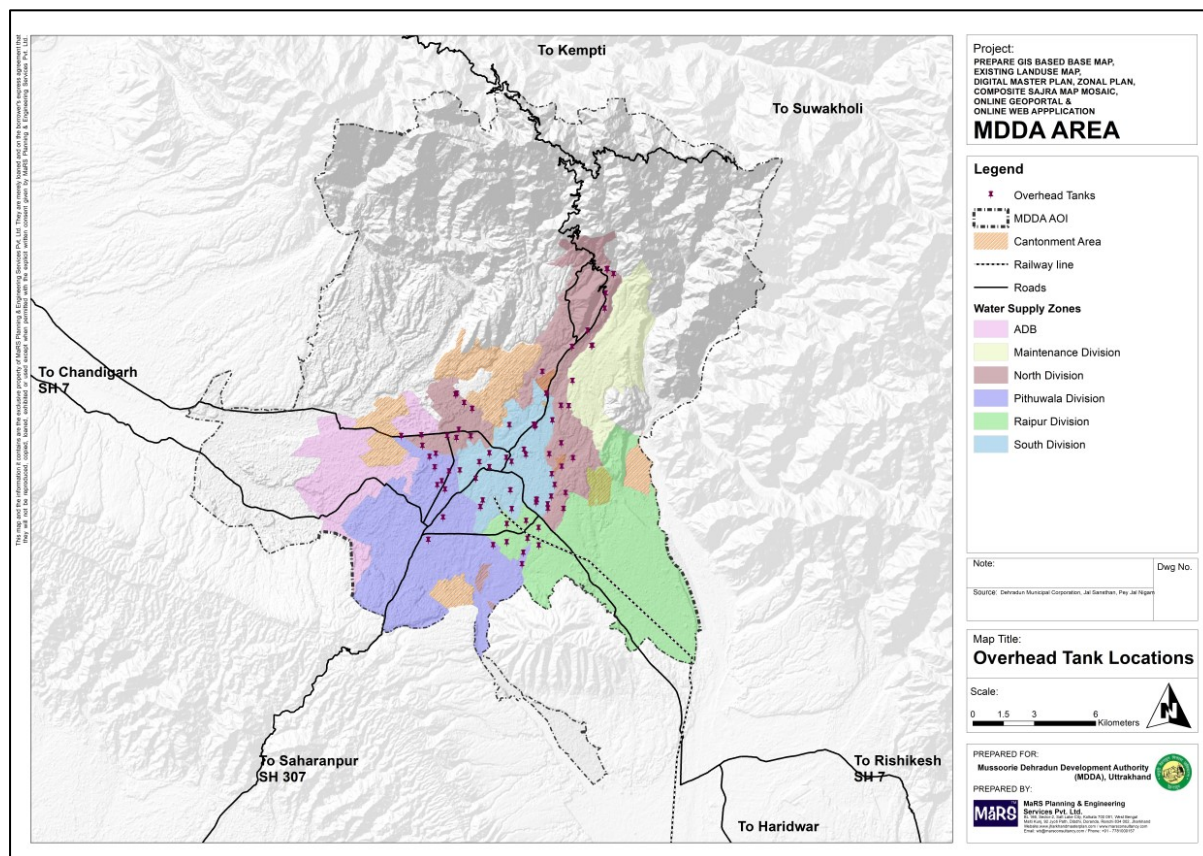
The per capita demand is determined by taking into account all water demands, which include domestic, commercial, industrial, institutional, fire, and public use. According to the URDPFI standard, per capita demand is 135 liters per capita per day, total demand for water is 169.4 MLD, supply is 150.25 MLD (from surface and subsurface sources), and system and friction loss is 35.5% of total water supply. Domestic supply per capita ranges from 170 lpcd to 150 lpcd in zones 35 and 11 (Nehru colony and Rajendra Nagar) to 65 lpcd in zones 18 and 5 (Panditwadi and Cement Road), with an average of 114 lpcd.

The city is divided into four main zones, which are further divided into 51 zones for better management. Five zones are water sufficient, with a water supply of 135 lpcd, and 46 zones do not receive enough water. As a result, 23 zones are managed under the Atal Mission for Rejuvenation and Urban Transformation (AMRUT) and executed by the Peyal Nigam (Dehradun division), while the remaining 23 zones are managed by the Asian Development Bank (ADB).

8.2.4 Water Storage System

There is a total of 99 OHT and 27 Clear Water Reservoir located all over the city for storage of a total capacity of 10 million liters. Water is continuously pumped into these facilities and drains out for supply; this constitutes a continuous process of demand and supply. Maximum OHT locations are within the core city area.

Map 8-3: Location of OHT's



Source: Water Balance Plan of Dehradun, 2020

8.2.5 Water Treatment Plant

To treat the surface water, 4 water treatment plants are located at different locations: Their water treatment capacities are described into the table which is given below.

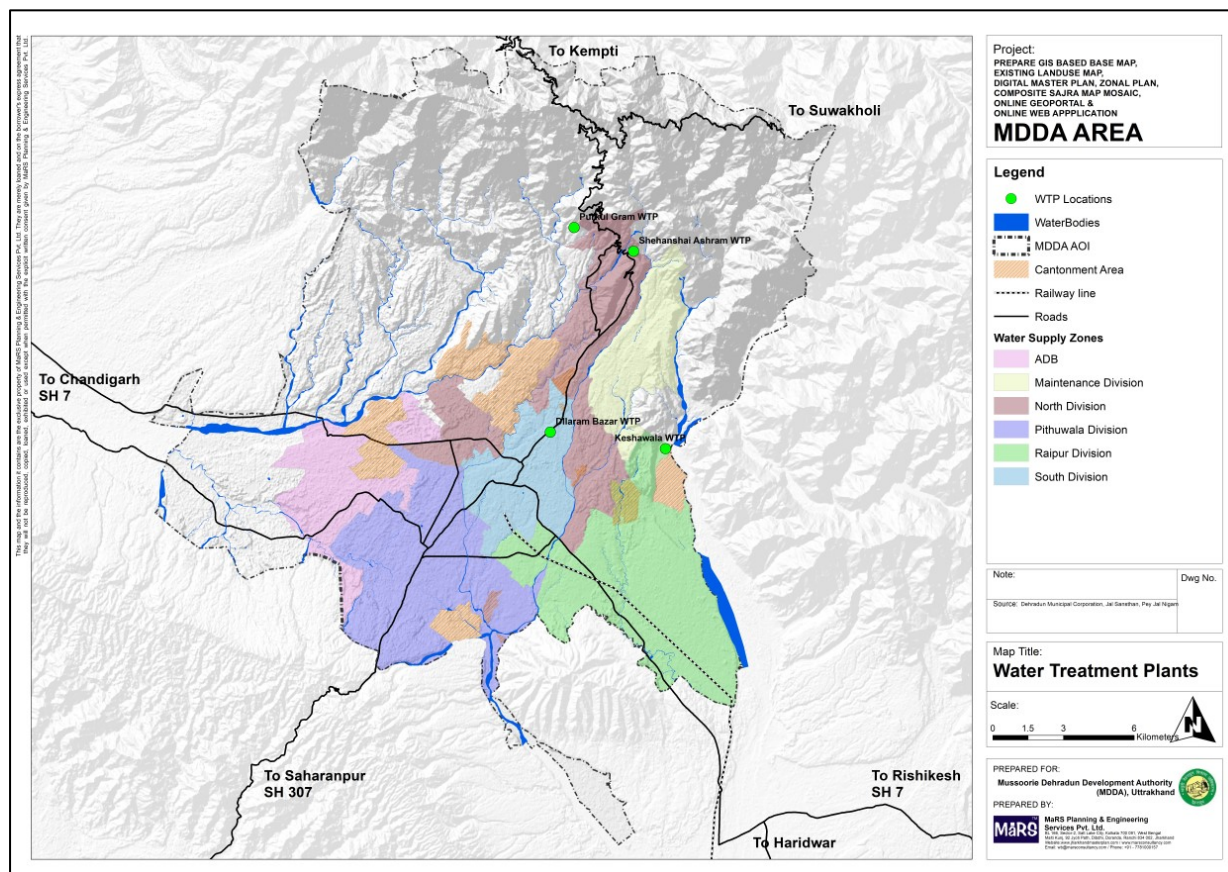
Table 8-3: Details of Water Treatment Plant in Dehradun

Sr. No.	Location	Existing Capacity (MLD)	Added Capacity (MLD) in ADB Project	Total Capacity (MLD)
1	Dilaram Bazar	20.00	7.50	27.50
2	Shehenshai Ashram	0.00	15.00	15.00
3	Purukulgram	14.00	0.00	14.00
4	Keshawala	3.6	—	—
Total		37.6	22.50	56.50

Source: Understanding the Water Flows in Dehradun, 2018

Water Treatment Plant at Diagram Bazar and Shehenshai Ashram is 70 years to 30 years old respectively. The Purukulgram has been proposed with 10 MLD of softening plant. Quality of water being produced at Dilaram Bazar is potable but at Shehensai Ashram, hard water is being produced as water softening plant arrangement does not exist.

Map 8-4: Location of WTP in Dehradun



Source: Understanding the Water Flows in Dehradun, 2018

8.2.6 Water Supply Network/ Distribution

Dehradun is divided into three water supply zones: gravity flow, pumping flow, and mixed flow. The northern part of town, primarily Rajpur Road and the surrounding areas, is served by gravity flow, whereas the southern part of town, including the old city area, is served by pumping. A third zone has emerged between these two, which can be referred to as a mixed zone because water is supplied by both pumping and gravity ("City Development Plan of Dehradun," 2007).

Pipelines bring the raw water from the Surface sources and the pumps located all over the city. Surface water is treated before it is supplied to consumers. The treated water is transferred to master reservoirs and then supplied to the city, mainly to the northern suburbs. As per the Water Balance Plan of Dehradun, the northern section of the city Rajpur road, has lower groundwater potential and water table, therefore dependent on surface water sources. They are partly served by the reservoir. The **water transmission of 650 km and service pipes of 3200 km cover the entire city**. Water supply and water pressure to each ward is dependent on the total water availability. There is a total of 1.73 lakh water connections in the city. Nearly 85 percent connections are domestic connections including slums. The commercial connections are 15 percent. Industrial complexes do not depend on Water institutions for supply and drainage

As per the survey done by ADB in the year 2011(Urban Development Department, GoU, 2011) the total distribution network of water supply is about 564 km laid periodically. Most of these pipelines are very old and have out lived their service life. In many stretches these pipelines have gone to deeper depths due to road widening and now it became inaccessible for repairs. The average supply duration is 8 hours, ranging from 6 hours to 10 hours,

The water supply hours in the piped areas are about 4 hours twice a day but in low lying areas the supply continues beyond closing hours and also in some areas supply is available only once and that too in late night hours. There are at least 30 crisis localities where water supply is provided

through tankers ("City Development Plan of Dehradun," 2007). There is no metering system in the city, the bill is calculated on the basis of house tax per connection basis.

Tariffs based on this system are applicable not only to registered connections but also to consumers who have not taken water and sewerage connection as such consumers are charged on the basis of water tax and sewerage tax which are taken as a percentage of the annual rental value of property.

Table 8-4: Existing Tariff Structure for Domestic use and non-Domestic use

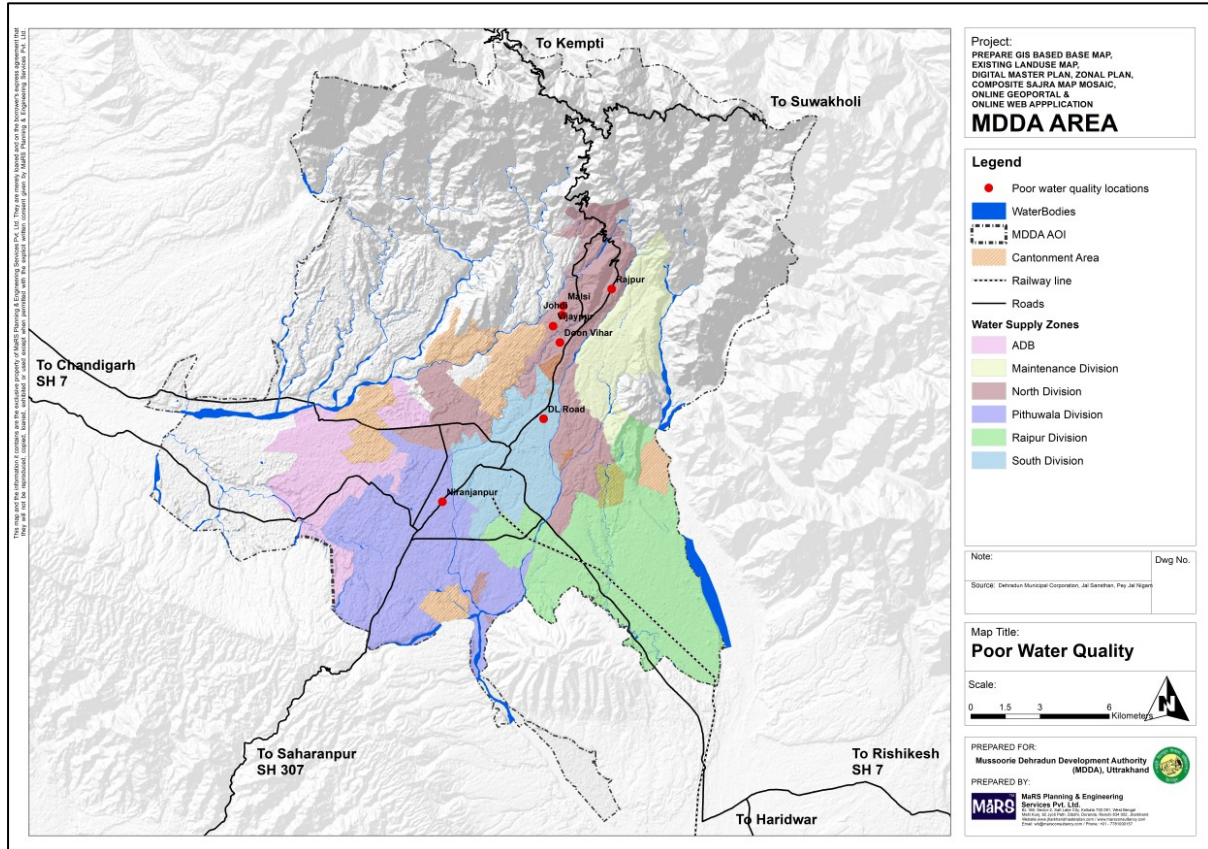
Type of Charge	Targeted Consumer	Rate per month based on 10kl water consumption				
		Slab	Gravity	Low Head	High Head	
Domestic						
Water Charge	Applicable to all registered connections	Till 360 Rs to above 8001 as per the Annual Rental Value (ARV) of the property	77 Rs- 161 Rs	80.50 Rs- 172.50 Rs	86.25 Rs- 184 Rs	
Non- Domestic						
Water Charge	Nondomestic users including industries, commercials set ups, government.	Volumetric based on meter reading	Special category and industrial	8 Rs	10 Rs	12 Rs
			Other commercial establishments	7 Rs	8 Rs	10.50 Rs
			Government and semi-government institutions	6.70 Rs	7.50 Rs	10.50 Rs

Source: Cost Recovery and Tariff Practices for Urban Water Supply and Sanitation in India- Dehradun Case Study

8.2.7 Water Quality Assessment

In June 2020, a survey was conducted by Dehradun based Society of Pollution and Environmental Conservation Scientists (SPECS) to determine the quality of the tap water supplied in several localities of Dehradun district. 125 Number of localities in the districts where samples were taken and tested. 65% of the surveyed localities showed the presence of fecal coliform which is a major contributor in causing stomach diseases. More than 36 localities where absorbed chlorine levels were found to below the prescribed norms, which can cause skin diseases. 7 Localities including Rajpur, Johri village, Doon Vihar, Malsi, Vijaypur Road, DL Road, and Niranjanpur, have a high presence of hard water content.

Map 8-5: Areas with poor quality of water



Source: Pollution and Environmental Conservation Scientists (SPECS)

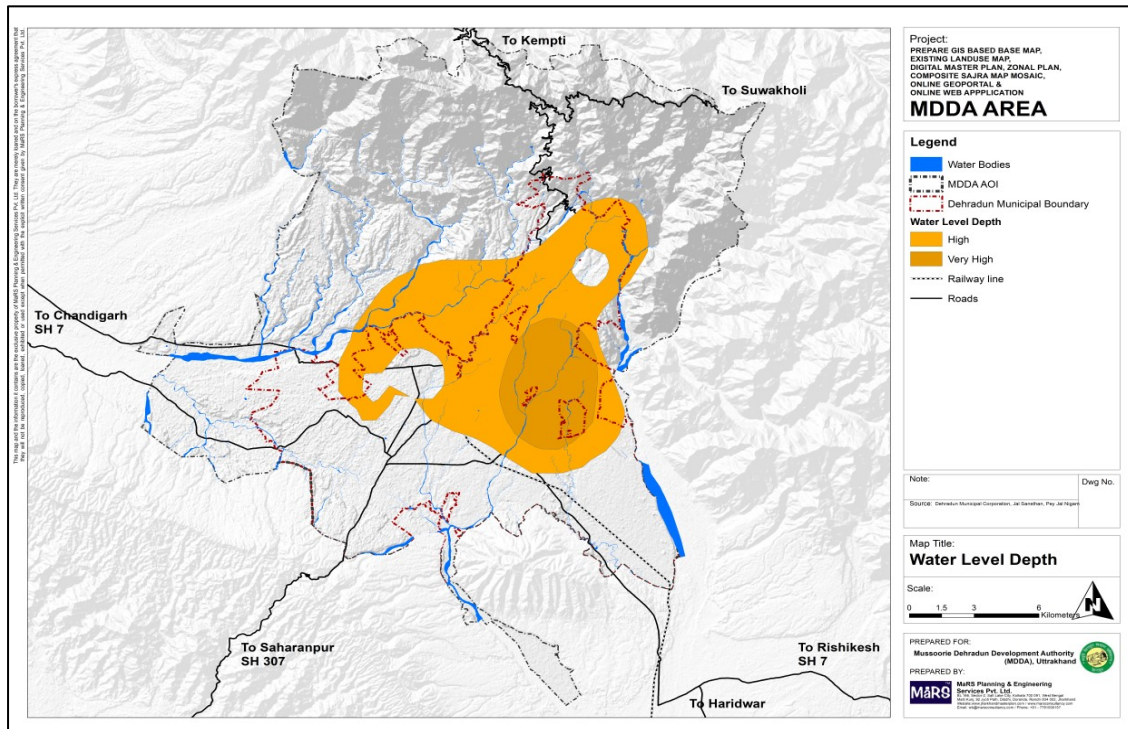
8.2.8 Surface and Ground Water Recharge Potential

National Institute of Urban Affairs (NIUA) has conducted zone wise assessment of water balance. Their results are shown in the figure below. There is a huge potential of Ground Water Recharge especially into the Census Towns those are now merged into the Dehradun Municipal Corporation Limit (South East Wards of Dehradun Municipal Corporation) such as:

1. Nathan Pur,
2. Nathuwa wala and
3. Patches between Clock Tower, Ballupur & Prem Nagar (West part of Dehradun Municipal Corporation)

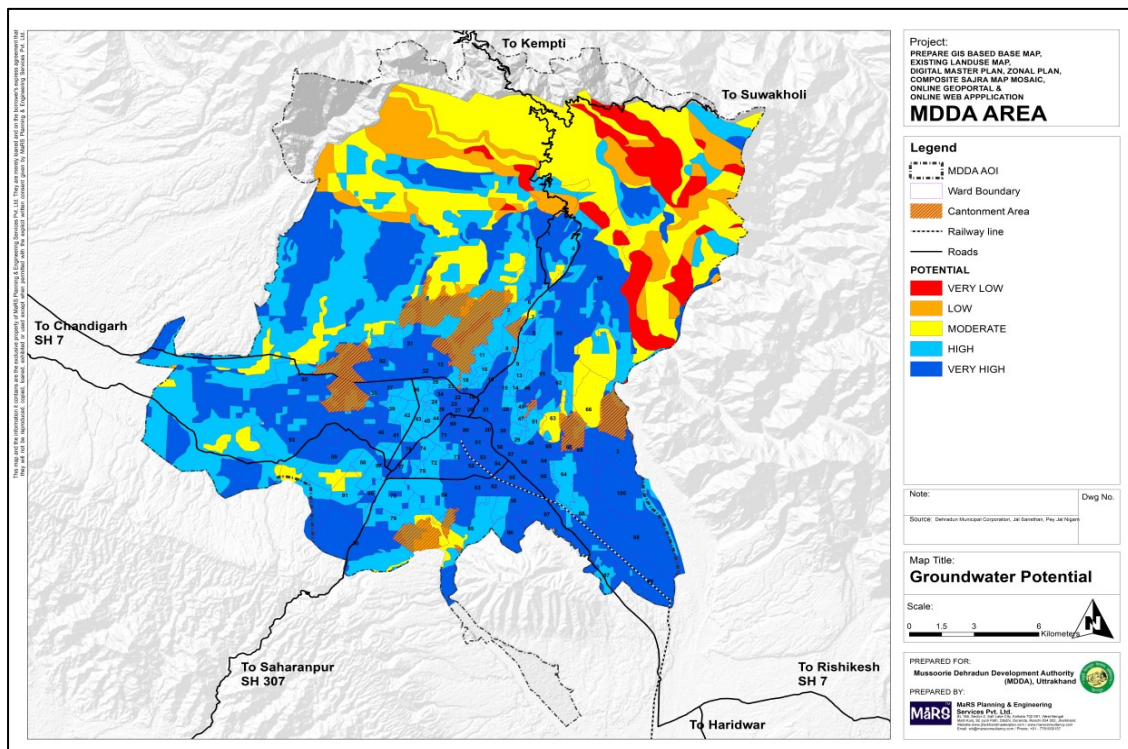
Low ground water recharge potential is observed into the northern part (towards Mussoorie area) of the region. But, into the Dehradun City, hydrological soil group, pedi plain and crop land have high infiltration ability due to that reason, maximum city area has high to very high ground water recharge potential.

Map 8-6: Ground Water Level Depth



Source: Water Balance Plan of Dehradun, 2020

Map 8-7: Ground Water Recharge Potential



Source: Water Balance Plan of Dehradun, 2020

Tributary of Yamuna River which passes from the west portion of Dehradun is completely dried. Seasonal Flows is also not observed since past 20 years. Same situation is observed at many locations of Song River which is a tributary of Ganga River and passes from the east part of the region. Unauthorised constructions on the river bed of song are observed at many locations in Dehradun. Situation is also same on Rispana and Bindal Rivers.

These matters should be taken under consideration to reduce the ground water dependency into the region. There is a huge requirement for groundwater recharge and its related projects into the region through River Development Projects.

8.2.9 Service Level Bench Mark

As per the city sanitation plan, the service bench mark is presented in the below table

Parameters	SLB Norms	Current Status
Coverage of Water Supply connections	100%	93%
Per capita supply of water (lpcd)	135	194
Extent of metering of water	100%	0
Extent of non-revenue water (NRW)	20%	26-60%
Continuity of water supply	24x7	1-4 hrs.
Quality of water supplied	100%	*80%
Efficiency in redressal of customer complaints	80%	*60%
Cost recovery in water supply services	100%	50%
Efficiency in collection of water related charges	90%	NA

**Based on primary survey and stakeholder consultations*

8.2.10 Ongoing projects for water supply augmentation

There are various ongoing projects for the augmentation of water supply

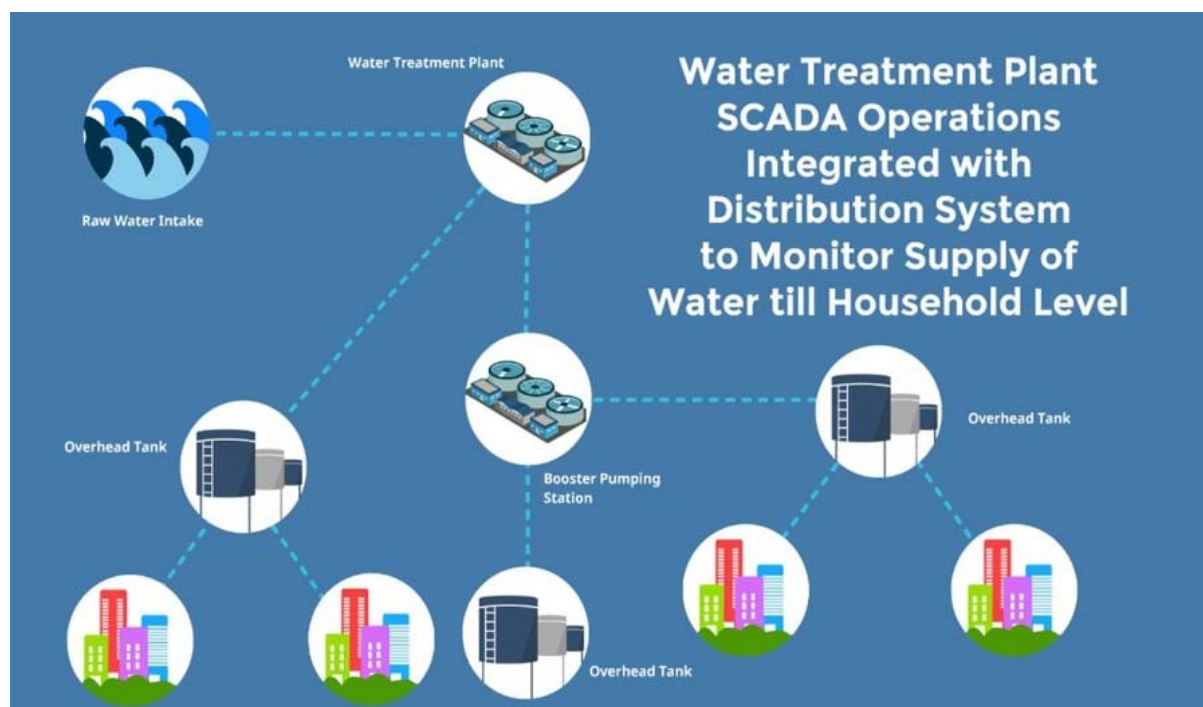
8.2.10.1 Replacement of old problematic rising mains

Water Distribution network reorganization of approx. 36kms within the area, which was left out for reorganization after completion of ABD project has been proposed under Smart City Plan. Replacement of old problematic rising mains of three tube wells located at Nehru Colony, feeding overhead tanks at Parade Ground, Dilaram Chowk are under implementation. Additional Tube well to improve water availability and an additional overhead tank in Tehsil Campus to increase storage capacity in Tehsil and Nagar Nigam area also under implementation. Replacement of old and problematic 2.56 Kms AC distribution main from Nagar Nigam is proposed improve water distribution in the area.

8.2.10.2 Smart Water Supply – SCADA System - Ongoing

Supervisory Control and Data Acquisition (SCADA) for quantitative and qualitative monitoring of water production from the existing 198 tube wells in the city and water distribution from 72 overhead tanks has been proposed under Smart City Mission. This will ensure automated control of proper quantity and quality of water being supplied to public. The data acquired shall also help Jal Sansthan to take remedial measures to improve water supply promptly as and where required.

Figure 8-1: SCADA SYSTEM



Source: <http://smartcitydehradun.uk.gov.in>

8.2.10.3 Water Metering

Presently, all drinking water connection are unmetered. The consumers are being billed for consumption of water either on the basis of house tax assessment or minimum charges for different category and size of connections. It has been proposed to install smart meters on all 5403 non-domestic connections under Dehradun Smart City Plan.

These meters will have automatic meter reading facility with remote meter reading device and generation of software-based bill generation for actual quantity of water consume by each consumer. It is expected to regulate consumption of drinking water by bulk connections like hotels, institutions, business houses and other commercial users, shall inforce water discipline, make the consumer pay for what they consume and shall empower Jal Sansthan for software based automated water billing and revenue collection in Dehradun Smart City.

8.2.10.4 Smart Water ATM's

Automated treated water dispensing unit at a public place will be helpful to get low-cost water to the residents as well as visitors to the city. 24 water ATMs have been installed at various locations in Dehradun. Most of these ATMs are installed in busy market places, or areas widely used by the public. For example, there is a water ATM at the railway station exit; one is stationed near Dehradun's landmark clocktower; and sometimes in residential areas too such as MDDA colony in Dalanwala.

8.2.10.5 Public and private sector functioning in Water supply

There are many Central and State Government Department functioning in this concern. Some of the water sectors working in Dehradun are- Uttarakhand Jal Sansthan(UJS), Uttarakhand Peyjal Sansadhan Vikas Evam Nirman Nigam(UPSVENN), Uttarakhand Environmental Protection and Pollution Control Board(UEPPCB), State Water Supply and Sanitation Mission, Swajal, etc. Some NGO's are also operating in Dehradun in assessing the water quality of Dehradun like People's Sciences Institute and SPECS.

8.2.11 Gap Analysis

The following are the main reasons for demand supply gap:

- With the increase in population, demand has increased

- Resource constraints for systematic upgradation of the system
- The existing water transmission and distribution system suffer from defects and huge system losses as these have also outlived their design period life. They have become insufficient to cope with the increased demands of the city.
- WTPs have outlived their design period life and therefore are not functioning at their full capacity.
- There is no water metering system at the consumer end and therefore, there is indiscriminate usage of water and losses in water supply and revenue.

8.2.11.1 Water Demand Projections

The water demand is calculated based on water requirements of one person per day as per CPHEEO guidelines, i.e. 135 lpcd. However, the requirement of a particular unit to be calculated separately as per the norms prescribed. The net water demand comprises the consumption for domestic and non-domestic purposes. Non-domestic user includes consumption by Institutions (Colleges, School and Hospital), Commercial Establishment, Industries, Public Parks, Hotels, Tourist places etc. For non-domestic users also average demand of 135 lpcd is calculated. Gross water demand comprises network demand and physical and non-physical losses (assumed 15%). Being a tourist city, we also need to calculate the water demand of the tourist population. Considering 150 lpcd for floating population, the final water demand of the region for the year 2041 is described below.

Table 8-5: Water Demand Projections

S.No.	Project Area	Resident	Floating	Total
1	Projected Population	21,98,155	1,59,125	23,57,280
2	Water Consumption (LPCD)	135	150	—
3	Projected Water Demand-2041* (MLD)	296.75	23.87	320.62
4	15% O&M Loss (MLD)	44.51	3.58	48.09
5	Sub-Total	341.26	27.45	368.71
6	2% Fire Fighting (MLD)	6.83	0.55	7.37
7	Grand Total Water Demand (MLD)	348.09	28.00	376.09
8	Available Water (MLD)	—	—	118.55
9	Net Water Demand (MLD)	—	—	257.54

Total population projected for the year of 2041 is 23,57,280. Considering 135 LPCD water demand for residential population and 150 LPCD water demand for floating population, additional 255.41 MLD water will be required.

8.2.11.2 Requirement of Water Treatment Plant

As per the projected water requirement, there is a need of 376.09 MLD till the horizon year. Current treatment capacity of 4 WTP's is around 56.50 MLD. So, the additional requirement will be around 319.59 MLD. The total area required for it will be around 6.39 Hectare.

8.3 STORM WATER DRAINAGE

8.3.1 Present Scenario

For a city like Dehradun, where the natural slopes are quite favourable with regard to the storm water drainage, even simple steps to preserve its natural drains could lead to significant improvements. The city already has a master plan for its storm water drainage system. An assessment of the existing drainage situation of the city followed by the proposed interventions for its further improvement is presented in this section based on the finding of “The Final City Sanitation Plan – 2017 for Dehradun City”.

In a typical urban setting characterized by densely built-up areas, the storm water management becomes a critical issue due to diversion of open lands, increased built up areas and encroachments of water bodies, etc. Due to the unique monsoon rainfall pattern in the Indian subcontinent, most of the towns in the country get adversely affected due to short-duration-high-intensity rainfall where the available infrastructure is unable to cope with the surge of surface run off, leading to temporary flooding/ stagnation in important areas, let alone the low-lying low-income areas. E.g.- Several low-lying areas like Suman Nagar, Shastri Nagar, Chander Road Nayee Basti, Mata Mandir Road etc to name a few.

8.3.2 Natural Drainage Network

Dehradun city has river Song in the east and river Tong in the west. Due to its hilly terrain, the city has a natural gravity-based drainage system with sufficient gradients to drain off storm water easily into the two main natural drainage channels i.e., rivers Bindal and Rispana. The discharge from other minor rivers Asan, Tons and Dulhani drains into these two rivers directly or through their tributaries. The slope of both the main rivers i.e., Rispana and Bindal is from North to South.

1.1.

8.3.3 Drainage Pattern

According to the drainage master plan prepared by UPSVWNN (presently UPN), the city has 5 major drainage basins with the total catchment area of around 70 sq. km. Details of the catchment area of each of the drainage basins are provided in Table given below.

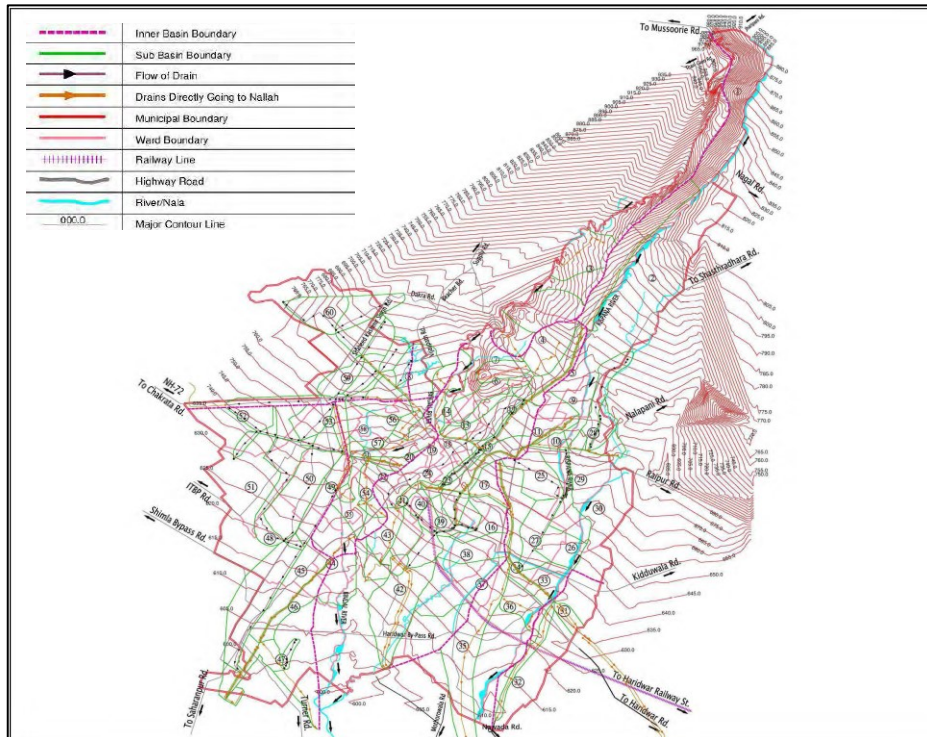
8.3.4 Municipal Area Drainage system

Table 8-6: Drainage Basins as per the Drainage Master Plan within Dehradun Nagar Nigam

Name of the Basin	Catchment Area (sq.km.)
Bindal main Basin	19.17
a) Bindal sub-Basin-1	4.08
b) Bindal sub-Basin-2	2.08
c) Bindal sub-Basin-3	5.62
Rispana Basin	27.40
Dulhani Nadi Basin	1.96
Asan River Basin	4.29
Tons River Basin	5.03
Total	69.81

Source: Final City Sanitation Plan, 2017 for Dehradun City

Figure 8-2: Drainage Pattern of Dehradun City



Source: Final City Sanitation Plan, 2017 for Dehradun City

As per the drainage Master plan, there are around 11 main drains (Nallahs) in the city through which most of the storm water of Dehradun is discharged into the rivers Bindal and Rispana. List of these drains along with the area covered by each drain is provided in to the table given below. During the field investigation, it was observed that most of the drains are ill maintained, damaged and dumped with municipal solid waste. Dumping of garbage, particularly plastics cause serious reduction in waterways of main drainage channels.

Table 8-7: Main Drain/ Nallah following within Dehradun Nagar Nigam

Sr. No.	Name of the Drain/ Nallah	Length/ Width	Areas Connected	Outfall
1	I.T Park	1.7 Km / 10-17 m wide	Dhoran Vil, Sahastra Dhara Rd., Rajeshwar Rao Nagar	Joins Mayur Vihar Nallah, and drain into Ri. Rispana
2	Mayur Vihar	5.4 Km / 3 - 5 m	Sindhowali, Chindowali, Mayur Vihar, Keval Vihar, Suman Puri, SBI Colony	Ri. Rispana
3	Ambiwala Gurudwara	3.3 Km / 3.5 – 5 m	Badrish Colony, Jyoti Vihar, Dharampur Danda, Shatri Nagar, Defence Colony, Inderpur	Inderpur (on periphery of DNN) into Ri. Rispana
4	Nala Pani	1 Km / 1 - 2 m	Vikas Lane Colony, D-2, 3, 4, Keval Vihar, Sumanpuri, Nala Pani Road.	Partially unlined, drains into Ri. Rispana
5	Brijlok to New Cantt. Road Nallah	4.5 Km / 6 m	Salawala, Chandralok Colony, Dilaram Nagar, New Cantt.	Ri. Bindal

Sr. No.	Name of the Drain/ Nallah	Length/ Width	Areas Connected	Outfall
			Rd., Rajpur Rd	
6	Mannuganj Nallah	3.2 Km / 1.1 – 10 m	Ghantaghar to Moti Bazaar, Neshvilla Road, Mannuganj, Moti Bazaar, Anand Chowk, Dandipur, Khadri, Tilak Road.	Partially unlined, into Ri. Bindal
7	Chorkhala Nallah	1.7 Km / 3 – 9 m	Mitralok, Deeplok, Aakash Deep, Rajendra Bag B Block	Meets drain from irrigation colony, and drains into Ri. Bindal.
8	Goivindgarh Nallah	0.7 Km / 1.5 – 7 m	Shanti Vihar, Teacher Colony, Rajendra Nagar, Saiyyad Mohalla, Yamuna Colony	Ri. Bindal
9	Bhandari Bag Nallah	1.8 Km / 3 – 7 m	Lakhi Bag, Vishwakarma Colony, Bhandari Bagh, Pathari Bagh, THDC Colony	Meet Mannuganj Nallah and drain into Ri. Bindal
10	Chandannagar to Race Course drain	7.85 Km / 3 – 12 m	Haridwar Rd, Race Course, Chandannagar, Police Line, Race Course A,B,C, Sarawati Vihar, Kasai Mohalla	Ri. Bindal
11	Asian School Nallah	2.3 Km / 2 – 9 m	Ganga Vihar, Kalindi Enclave, Kamwali Village, Engineer Enclave, Om Vihar, Shasrti Nagar , ITBP Campus	Ri. Bindal

Source: Final City Sanitation Plan, 2017 for Dehradun City

Figure 8-3: Status of Strom Water Drains (Natural & Manmade) in Dehradun



Figure 8-4 Natural and Manmade drain



Figures above depict the current state of manmade drains and natural drains (rivers) in the city. Furthermore, as previously discussed, the city's topography and location at the foothills of the Himalayan Mountain range provide adequate natural drains for storm water. However, because of urbanisation and encroachment, the catchment area frequently floods low-lying areas. In general, solid waste dumping clogs natural drainage and manmade drains throughout the city, resulting in flooding/stagnation of storm water. Several low-lying areas, such as Suman Nagar, Shastri Nagar, Chander Road Nayee Basti, Mata Mandir Road, and others, where medium to low-income communities live, are particularly affected by this problem, with rain water stagnation reported for several hours to two days.

In terms of manmade drains, it was discovered that the city falls short significantly in terms of transporting storm water from and within the city to these natural drains. The existing man-made drains are inadequately designed to carry the generated storm water. It was also discovered that in the absence of an existing drainage map (for manmade drains), managing storm water within the city is difficult. According to MoUD guidelines, 100% of a city's road length, wider than 3.5 m carriageway, should have pucca and covered drains along the road length. In this regard, it is worth noting that Dehradun is said to have only 11% drain coverage. According to a map prepared by, the city of Uttarakhand Pey Jal Nigam (UPN) has approximately 965 kilometres of road network, of which approximately 130 kilometres are national highways and the remainder are city roads. The majority of these other roads either lack roadside drains or have drains of insufficient size. As a result, in order to improve storm water management within the city, the storm water drain must be constructed so that all storm water is carried to natural drains.

8.3.5 Gap Analysis

The stormwater drainage system's condition had deteriorated as a result of rapid and haphazard urbanisation. During the rainy season, some housing colonies in low-lying areas experience water logging and flooding. It has been observed that the primary issue is the comprehensive design of drains, including other utility network maintenance and operation. Because of faster population

growth and rapid increases in land prices, habitation has spread to low-lying areas that lack proper drainage outlets.

8.3.6 Demand Projections

By the year 2041, whole Dehradun area will be requiring water supply pipelines (both existing and proposed roads)

8.4 SANITATION AND SEWERAGE

Septic tank effluent and grey water from residential and commercial properties are the two types of wastewaters produced. The mixture of these wastewaters is managed in Uttarakhand's ULBs via a network of open and closed drains. Most cities are served by open drains, in which wastewater is collected from properties and flows by gravity to the lowest point, which is usually surface water bodies or forest lands. Closed drains include lined drains with covers and gravity sewers.

First Sewerage network in the city was proposed in 1958-59 to cater Dobhalwala, Chukkuwala, Lunia, Mannu Ganj, Khurbura, Lakshaman Chowk, Jhanda Mohalla, Paltan Bazar, Karanpur, Mansinghwala and Dhamawala. Through this project sewer lines were laid mainly along the main roads. Later on, through various schemes, sewerage network was laid in different parts of the city in a fragmented manner. As a result, some stretch of the city could have sewer lines.

As per census, 2011 around 39% of the households have been covered under the existing sewerage system. At present, the city has around 351 km of sewerage network being maintained by Uttarakhand Jal Sansthan (UJS). As per consultations with UPSVENN and UJS, most of the existing sewer lines have outlived its design life & need to be replaced or rehabilitated. In some areas, sewers are choked due to silting and manholes are blocked or covered by the roads etc. Due to that reason, the sewerage reaches the Sewerage Treatment Plants Partially and their full treatment capacity is underutilized.

Based on topography of the town, Dehradun City is divided into the 6 Sewerage Zones – Zone 1 to Zone 6. Their details are given below.

1. **Zone – 1:** Bindal river drainage zone which collects sewage from eastern part of the city for the proposed Kargi STP (71% of household are covered)
2. **Zone – 2:** Rispana River drainage zone which collects sewage from western part of the city for the proposed Daudwala STP (30% of households are covered)
3. **Zone – 3:** Separate saucer shaped topographical zone in the eastern part of the city which collects sewage for the proposed Indira Nagar STP. (0% of Households are covered)
4. **Zone – 4:** Very small saucer shaped zone in the northern part of the city which collects the sewage for proposed Vijay Colony STP. (100% of households are covered)
5. **Zone – 5:** Small saucer shaped zone in the northern part of the city which collects the sewage for proposed Salawala STP. (0% of households are covered)
6. **Zone – 6:** Very small saucer shaped zone in the northern part of the city which collects the sewage for proposed Doon Vihar STP. (50% of households are covered)

As per Dehradun Nagar Nigam latest details, these zones are partially served with sewerage network covering only 57,173 households which is 34% of the total households in the city. Remaining 66% households have on site containment systems.

8.4.1 Sewerage Collection and Transportation

As mentioned into the above section, Dehradun Nagar Nigam area is divided into the 6 sewerage zones. The sewage collected in the existing sewerage network is finally discharged into drains & rivers. Earlier, sewage was taken through a channel to an open land at Bhandari Bagh (24 acres' area) and distributed in nearby farms for cultivation, which is not a safe practice. As a part of on-going projects, decentralized sewerage system has been proposed, in which, the sewage from various parts of the city shall be transported through proposed network of around 362 km pipeline to around 8 number of newly constructed/proposed STPs at different locations of combined capacity of 118.13 MLD. The details have been summarized into the subsequent sections given below.

8.4.2 Sewerage Treatment Plants

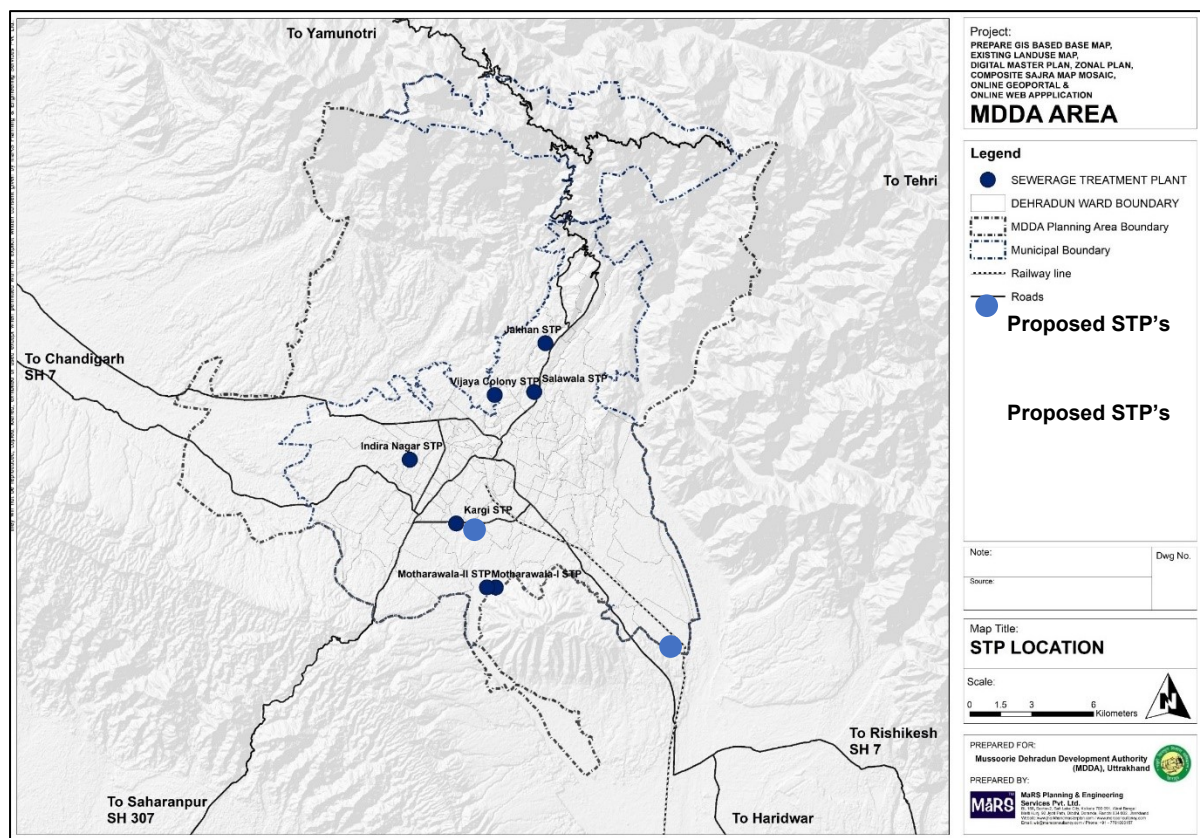
At Present, there are 8 Sewerage Treatment Plants (STP's) operational in Dehradun. Total present working capacity of installed STP's is 42.43 MLD (36.85% of total working capacity) against total working capacity of 118.14 MLD. Currently, total sewerage collected at various STP's is around 83 MLD which is almost double of the current working capacity of STP's into the Dehradun city. Their locations and details are given below:

Table 8-8: Details of Sewerage Treatment Plant in Dehradun

S.no	Name of STP	Capacity in MLD	Status	Programme
1	Indira nagar	5.00	Work in progress	JnNURM
2	Vijay Colony	0.42	Work in progress	JnNURM
3	Salawala	0.71	Completed	JnNURM
4	Jakhan	1.00	Work in progress	JnNURM
5	Mothorowala (Zone-L)	20.00	Completed	JnNURM
6	Mothorowala (Zone-L,M,C)	20.00	Work in progress	JnNURM
7	Kargi	68.00	Completed	ADB
8	Kaulagarh	3.00	Purposed	AMRUT
Total		118.13		

Source: Dehradun Nagar Nigam, 2021

Map 8-8: Location of Sewerage Treatment Plant



Source: City level sanitation study, 2020 – NIUA

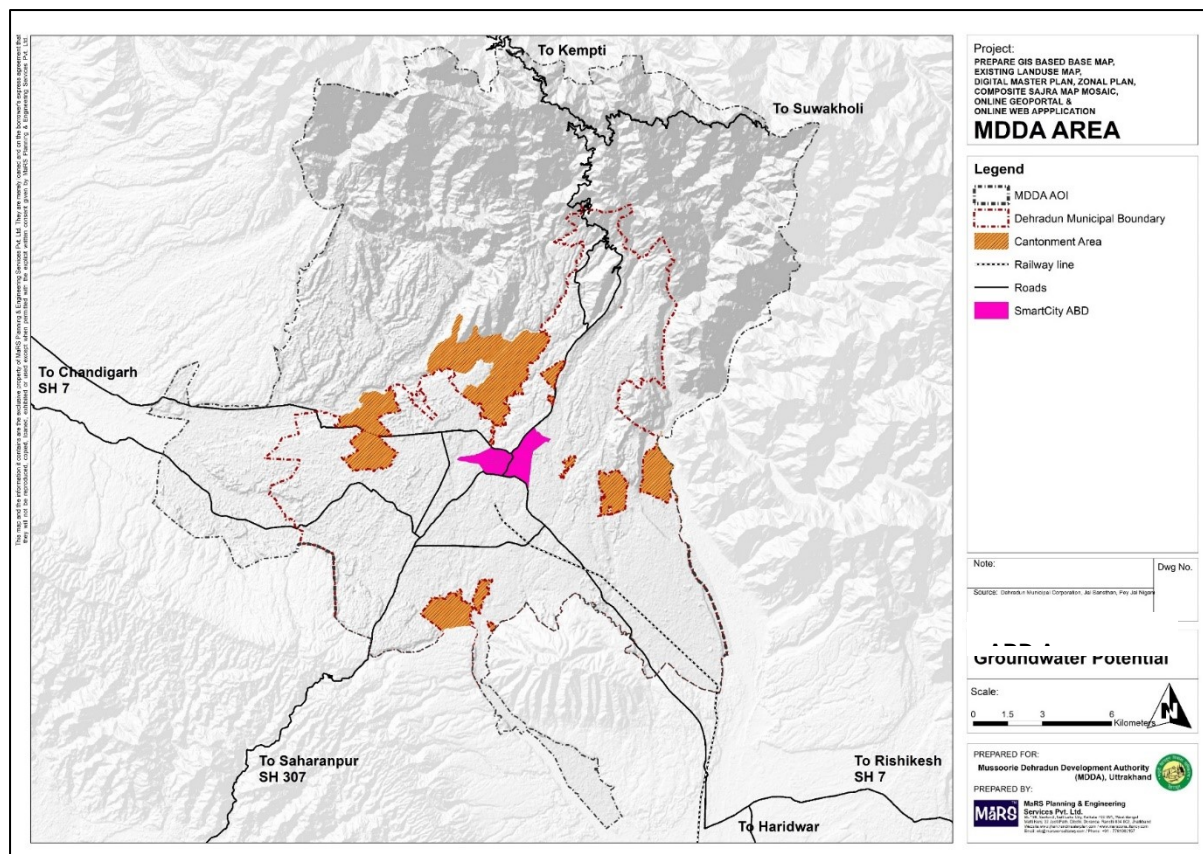
8.4.3 Ongoing Proposals

There is various ongoing project as mentioned below

8.4.3.1 Sewerage Line Project

The selected area of the Smart City is the oldest and highly populated area of Dehradun. This area is mostly sewered, but the sewer lines laid in the ABD area are 40-50 years old and have out lived their useful life. Most of the sewer lines and manholes are in dilapidated condition, as confirmed by Jal Sansthan. These sewers get choked often and their sewage is diverted into nearby open drains and nalas at many places. As a result, during heavy rain storms, the sewage mixed with rain water over flows on roads and residential/ commercial areas creating unhygienic conditions and much hardship to the inhabitants of these areas.

Map 8-9: Location of ABD Area under Smart City Mission



Source: <http://smartcitydehradun.uk.gov.in>

In these circumstances, the sewerage reaches the Sewage Treatment Plants (STPs) only partially and their full treatment capacity is underutilized. Also, substantial quantity of sewage percolates into the ground, polluting the ground water. Therefore, reorganisation/ replacement of sewerage system of entire ABD area is urgently needed. Sewer network design for the ABD area of Dehradun Smart City with connectivity up to existing outfalls of STPs and project for sewer lines has been proposed accordingly. The Project cost of the same is around 84.3 crore.

8.4.4 Gap Analysis

The existing sewer are old and dilapidated in some areas causing leaks. It does not work to its full capacity, especially in rainy seasons when the roads get blocked due to insufficient sewer lines and manholes.

8.4.5 Street Cleaning

Street cleaning is done in all wards of Dehradun city in the morning between 5 and 8 a.m., mostly by Nagar Nigam employees. The majority of the city's streets have been cleaned by the Dehradun Nagar Nigam. Its regularity varies, though, with sweeping occurring every day, alternating days, twice a week, once a week, and in certain places only sporadically. Regardless matter how wet and contaminated the waste coming out of the drains is, it is disposed of straight in the community bins. According to the City Sanitation plan, most slums and other areas with narrow streets have

less service compared to other areas of the city. During the field visit, it was observed that most of the containers were in bad condition and were overflowing with waste, creating a nuisance to the nearby areas.

Figure 8-5 Street Cleaning Activities in Dehradun city



8.4.6 Public and Community Toilet

Dehradun being a transit city for the tourists going to Mussoorie falls in both national and international tourist circuits. In addition to being the capital of Uttarakhand state, It is also an important academic, trade and commerce hub in the region. Important institutions like Indian Military Academy (IMA), Forest Research Institute (FRI) and many Engineering Colleges are located in Dehradun. To cater to the sanitation needs of visitors, transit passengers and tourists, public toilets are one of the essential social infrastructure components. In general, these should be located near bus stations, railway stations, and tourist spots, recreational centres, main markets/commercial places, hospitals, transit points and any other place that attracts large number of visitors.

According to the information from the Dehradun Nagar Nigam (DNN), there are reportedly around 77 numbers of Public/Community Toilets in the city. Out of the 77 existing public/community toilets, more than 22 toilets located in the slum areas are being used as community toilets. Among them, most of the public toilets are functional, have proper electricity & water supply but poor operation and maintenance services. Adequate water is not available for flushing and frequent cleaning which results in poor sanitary conditions, and thus, very low acceptability among the community members. The toilets maintained by private service providers (e.g. All the community toilets have septic tank system which need to be emptied frequently by a truck mounted vacuum tanker through paid service and the septage is eventually disposed of in open land or at the municipal solid waste dumpsite.

8.4.7 Urban Sanitation Policies, Laws and Governance

There are several sanitation laws and policies, which are listed below:

8.4.7.1 Laws & policies on water and sanitation

There are numerous laws in the form of acts pertaining to sanitation in the state of Uttarakhand. Some of them are adopted from the state of Uttar Pradesh after Uttarakhand was demarcated as a separate state. Table 6 gives a chronological list of acts related to water and sewerage which were passed by State of Uttarakhand. (Source: Situation Assessment Report, faecal sludge and septage management, Uttarakhand state April 2019)

Table 8-9: Acts and Laws of Uttarakhand state pertaining to water and sanitation

Year	Act or Law Passed
1961	Uttaranchal Municipalities Act
1959	Uttaranchal Municipal Corporation Act
1975	Uttarakhand Water Supply & Sewerage Act
2008	Uttarakhand Jal Sansthan Water Supply & Sewerage Bye-Laws
2011	Uttarakhand Building Construction & Development Bye-Laws/

Year	Act or Law Passed
	Regulations
2013	Uttarakhand Urban and Country Planning & Development (Amendment) Act
2013	Uttarakhand Water Management & Regulatory Act

As far as governance is concerned, there are multiple bodies in Uttarakhand state with overlapping roles and responsibilities. Hence, the institutional framework pertaining to liquid waste management is complex. The following table state all the state level institutions and their key roles.

Table 8-10: Roles and Responsibilities of various institutions

Institutions	Key Roles
Urban Development Directorate	Administrative department for local self-governments
State Urban Development Agency (SUDA)	<ul style="list-style-type: none"> • Functions under the UDD • Proper implementation and monitoring of the centrally assisted programmes for alleviation of poverty throughout the State • Swachh Bharat Abhiyan (SBA) Committee
Uttarakhand Housing & Urban Development Authority	• Development authority in relation to the whole of the State Area
Local Development Authority	Development authority in relation to any development area
Town & Country Planning Department	• Urban planning and development control
Uttarakhand Pey Jal Nigam (UJN)	<ul style="list-style-type: none"> • Planning, designing and execution of sewage and water supply services in urban areas • Ganga Pollution Control unit
Uttarakhand Jal Sansthan (UJS)	Operation and maintenance of sewage and water supply services in urban areas
Uttarakhand Environment Protection and Pollution Control Board (UEPPCB)	Monitoring and enforcement of environmental laws enacted by the central and state governments • Regulatory role for environmental protection, most importantly prevention and control of environmental pollution during the FSSM process such as desludging, treatment and disposal
Uttarakhand Urban Sector	Support the Government of India and State Government in their policy of balanced regional socio-economic
State Project Management Group, NGRBA	<ul style="list-style-type: none"> • Implementation of World Bank assisted 'National Mission for Clean Ganga (NMCG)' • Works under Department of Drinking Water and Sanitation
Urban local bodies (Nagar Nigam, Nagar Parishad or Nagar Panchayat)	<ul style="list-style-type: none"> • Implementation of SBM (Urban) and support in Implementation of AMRUT funded projects. • Provisioning of desludging services and ensuring the safety of sanitation workers employed by the local government

(Source: "Faecal Sludge and Septage Management in Uttarakhand: A Review of The Law and Policy Framework" by Centre for Policy Research.)

8.4.7.2 Uttarakhand Environment Protection & Pollution Control Board, Public Works Department (PWD) Schemes

Department and other line agencies functioning in the urban areas under various Urban Development Department schemes such as:

- Atal Mission for rejuvenation and Urban Transformation (AMRUT)
- Swachh Bharat Abhiyan-Urban
- Pradhan Mantri Awas Yojna-Urban (PMAY)
- National Urban Livelihood Mission (NULM)

8.4.8 Septage Management Protocol in Uttarakhand State

With reference to the national level FSSM policy, the Uttarakhand state has also developed their own protocol for septage management which was effective from May 2017. Formulated with the purpose to provide regulatory framework for management of septic tanks and appropriate maintenance and inspection & enforcement mechanism.

8.4.9 Water supply and sewerage byelaws (2008)

According to the Uttarakhand Jal Sansthan's Water Supply and Sewerage Byelaws (2008), it is mandatory for households to have either a sewerage connection or their own septic tank. Wet sanitation systems, which include a piped sewer network and a septic tank, are more common. As a result, households can be divided into two categories: those connected to a piped sewer system and those connected to a septic tank.

8.4.10 Gap Analysis

Existing public toilets are not sufficient as per the URDPFI guidelines. Also, existing public toilets lack infrastructural facilities like water supply, proper lighting etc. these poor sanitation conditions least open defecation within the city, hampering the socio- environment.

8.4.11 Projections of Estimated Sewerage Generation

Presently, total sewerage generation is around 83 MLD (total collected Sewerage at various STP's). For projected population, estimated sewerage generation will be around 255 MLD. Details are described into the table given below:

Table 8-11: Details of Total Sewerage Generation

Sr. No.	Project Area	Resident Population	Floating Population	Total
1	Projected Population	21,98,155.00	1,59,125.00	23,57,280.00
2	Projected Water Demand	296.75	23.87	320.62
3	Estimated Sewerage Generation (MLD) @80%	237.40	19.10	256.50

Source: Consultant Analysis

8.4.12 Requirement of Sewerage Treatment Plants

By 2041, sewerage generation will be around 255 MLD. Current Installed Capacity of STP's is around 118.14 MLD. So, STP will be needed for additional 138.36 MLD. For that, additional land will be required around 27.67 Hectare.

8.5 SOLID WASTE MANAGEMENT

8.5.1 Waste Generation and Segregation

Nagar Nigam is responsible for the management of solid waste in Dehradun city. Nagar Nigam has outsourced the waste collection, transportation, segregation and treatment to private companies and NGOs. Wards have been distributed among these organisations. According to the City Development Plan, Dehradun, the city generates 200MT of solid waste per day. The major sources of MSW are households, commercial shops, vegetable markets, hotels, and restaurants.

Table 8-12: MSW Composition

Constituent	Composition (%)
Organic Matter/Bio-Mass	65.0
Paper	3.5
Rags/textiles	6.0
Plastics	7.0
Glass	1.5
Rubber/ Leather	1.5
Metal	0.5
Stones	8.0
Sand/ Earth	7.0

From the above data, it can be seen that Organic matter has the highest composition (65.0) and metal has the lowest composition as per the CDP. There is an absence of segregation at the source among the residents. There are presently no segregation centres in the city. Only the two wards, managed by NGO- Waste Warriors, have their segregation plant in Harrawala.

8.5.2 Waste Collection and Transportation

There are door-to-door collection facilities provided by Nagar Nigam through collection vehicles, Still, the vehicles are insufficient to cover the whole city due to urbanisation. Almost 2 vehicles are used to cover each ward.

Due to a lack of adequate community bins and inefficient door-to-door waste collection from households, residents have no choice but to dispose of waste in designated open spaces or at the nearest community bin, which is usually overflowing with excess waste, adding to the odour nuisance and major health impacts. It is worth noting that even drain cleaners are disposed of in bins or open spaces, which during the monsoons flow back into the drains along with the scattered solid waste, choking and blocking the normal flow of drains.

Figure 8-6 SWM Collection Vehicles in Dehradun



8.5.3 Waste Disposal and Treatment

The collected waste from the entire city of Dehradun is transported to the open waste disposal site located at Shastra Dhara Road, around 10 km away from the city. The site is spread over 4.047 ha of land owned by the DNN.

As per DNN, around 200 tons of MSW are transported daily to this waste disposal site. However, without any weighbridge/record-keeping mechanism, these figures may be considered only a guess estimate of DNN. Field visits and observations reflect that although the site is enclosed by a boundary, heaps of waste is overflowing and spreading even beyond that enclosure. There is an urgent need for DNN to finalise the development of its waste treatment & disposal facility.

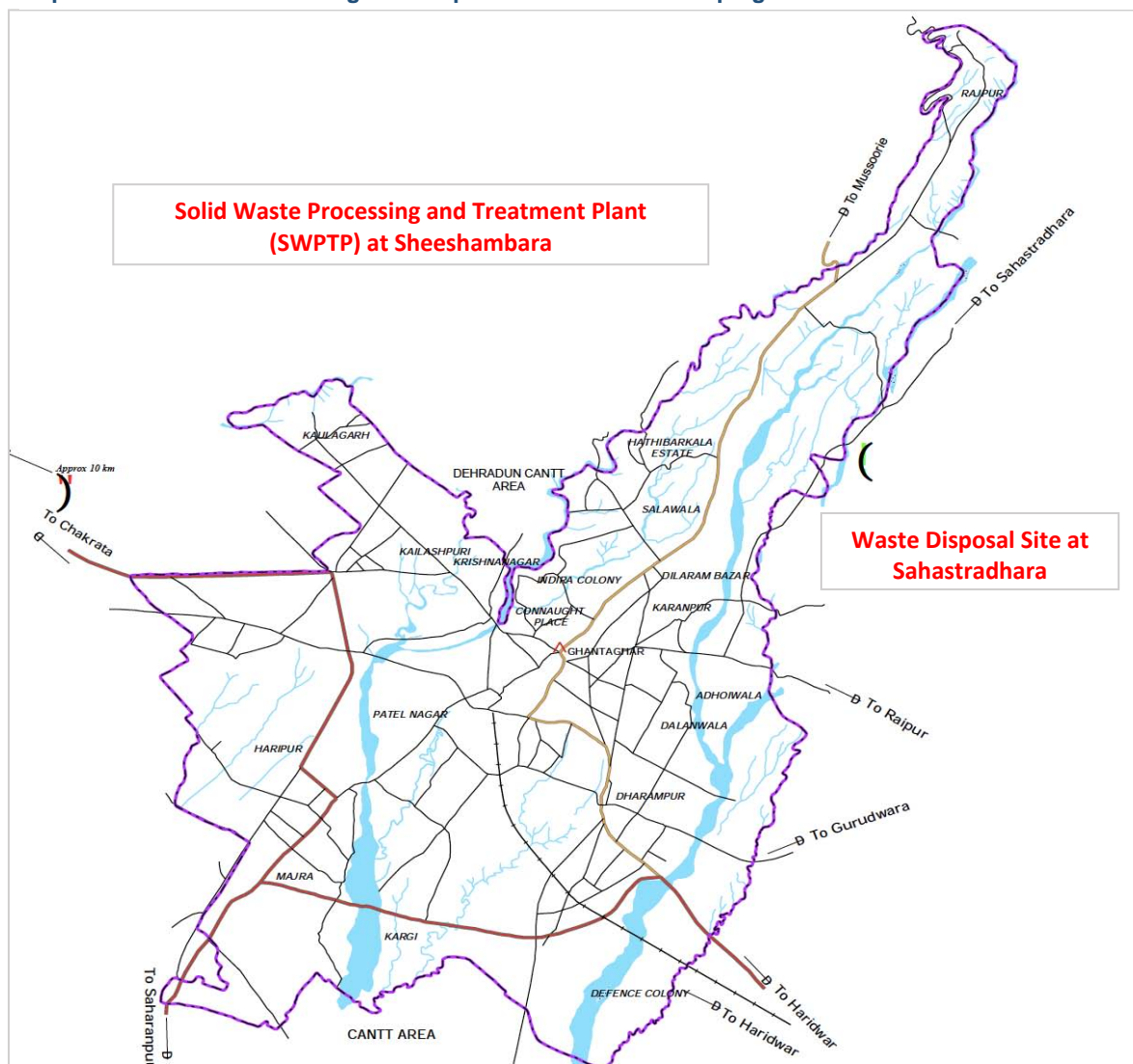
According to DNN, a new site at Sheeshambada of 8.323 Ha area for creating Integrated Solid wastes management facilities has been given ago-ahead by the central government. However, clearance from the National Green Tribunal (NGT) is still awaited. However, at present no construction work has been initiated. Landfill site: Kargi Location - Near Kargi chowk

8.5.4 Bio and Hazardous Waste Management

Due to the pandemic in past years, biomedical waste is generated not only from healthcare facilities but also from quarantine centres and households. Bio-medical waste ought to be segregated in the households as well as from municipal solid waste. Thus, it has to be properly

disposed of to eliminate the risks of infection among the workers handling municipal solid waste in urban local bodies.

Map 8-10 : Location of Existing and Proposed Solid Waste Dumping Site



Source: Final City Sanitation Plan 2017, for Dehradun City

8.5.5 Industrial Waste Management

Majority food processing industries are in city who generates organic waste and the waste is being treated by companies on their own.

8.5.6 Landfill Sites

For Disposal of 1055.34 Metric Tonnes of Waste, near around 53 Hectare of land will be required. Currently, only around 4 Hectare of land is available for the disposal within the planning area boundary.

8.5.7 Ongoing Proposals

Initiatives related to Solid Waste Management have already been taken under various schemes for the betterment of society, such as:

8.5.7.1 Solid Waste Management based upon Plasma Gasification Technology under Smart City Mission

Solid Waste treatment and disposal utilising plasma arc gasification process is an option for eco-friendly solid waste management in which large volume reduction of waste up to 95% is possible. The plasma gasification process uses electricity to generate high-temperature which converts the waste generation into electricity.

8.5.7.2 Waste Warriors – A Solid Waste Management NGO and Registered Society

Waste warriors are working for initiatives in rural, urban, and protected areas and to pioneer replicable models of resource management, innovative practices, research and education in the field of solid waste management

8.5.7.3 National Mission for Clean Ganga (NMCG)

Registered as a society on 12th August 2011 under the Societies Registration Act 1860. It acted as the implementation arm of the National Ganga River Basin Authority (NGRBA), which was constituted under the provisions of the Environment (Protection) Act (EPA), 1986.

8.5.8 Service Level Benchmark

The Ministry of Urban Development has introduced Service Level Benchmarking (SLB) as one of the appropriate systems for information management, performance monitoring and benchmarking. This system aims to improve not only the service providers but also the delivery of services to consumers. These are indicators the stepwise performance in MSWM at the ULB level.

Table 8-15: Service level Benchmark for Solid Waste

Performance Indicator	Benchmarks	Current Level
Household level coverage of solid waste management services	100%	84.8
The efficiency of collection of municipal solid waste	100%	77.8%
The extent of segregation of municipal solid waste	100%	10%
Extent of municipal solid waste recovered	80%	15%
Extent of scientific disposal of municipal solid waste	100%	0%
Extent of cost recovery in solid waste management services	100%	9.9%
Efficiency in collection of solid waste management charges	90%	44.4%
Efficiency in redressal of customer complaints	80%	74.1%

Source: Consultant Analysis

8.5.9 Gap Analysis

Only 10% of SW gets segregated and out of which 15% waste is recycled as per the service level benchmarking. Also, no waste is treated in a scientific proper manner which hampers the environment and social factors of the city.

8.5.10 Estimation of Solid Waste Quantity

Solid waste generation is estimated considering 400 gm. / capita/ day for residential population and 300 gm. / capita/ day for floating population. The details are described into the table given below. For the population of 23,57,280 estimated waste generation by 2041 will be around 1060.78 Metric Tonnes per day.

Table 8-16: Estimated Solid Waste Generation

S.No	Project Area	Resident Population	Floating Population	Total
1	Projected Population	21,98,155	1,59,125	23,57,280
2	Estimated Solid Waste (in KG)	98,91,69,750	7,16,06,250	1060776

3	Estimated SW Generation (Metric Tonnes)	989.17	71.61	1,060.78
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Future Land requirement for the Disposal of Waste will be around 40.7 Ha.

8.6 POWER SUPPLY

Power sector plays a vital role in infrastructure and growth of economy of every state. Uttarakhand has grown at a faster rate in order to eliminate the differences between it and other existing states. Uttar Pradesh State Electricity Board (UPSEB) was founded on 1st April 1959. However on 14th January 2000, the functions of UPSEB were transferred to the following three Corporations registered under Indian Companies Act, 1956:

1. **Uttar Pradesh Jal Vidyut Nigam Limited (UPJVNL):** it owns and operate the existing and under construction hydro power stations of UPSEB.
2. **Uttar Pradesh Rajya Vidyut Utpadan Nigam Limited (UPRVUNL):** it owns and operates the existing Thermal Power Stations of UPSEB.
3. **Uttar Pradesh Power Corporation Limited (UPPCL):** it operates for Transmission and Distribution of electricity in Uttar Pradesh

8.6.1 Sources of Energy/Power

There are five major energy sources through which electricity is generated in the state.

Table 8-17: Sources of Energy

Sr. no	Type of Plant	Capacity in Mw
1	Coal	399.50
2	Gas	69.35
3	Nuclear	22.28
4	Hydel	2441.80
5	Other Renewable Sources	244.32

Source: Power Scenario of Uttarakhand, December 5, 2016

8.6.2 Renewable Energy Production

Uttarakhand is richly endowed with natural renewable resources for generating electricity. Being developed as an “energy state” and tap its huge Hydro Electric Power (HEP) potential of 20,000 MW, Uttarakhand intends to increase its capacity to 5,000 MW HEP by 2011-12. 4000 solar water heaters with heating capacity of 97,500 litres per day, seven biogas bracketing plants, 12 solar plants, and a state level energy park in Dehradun. The State Level Energy Park has been established at Patel Nagar, Industrial Area, Dehradun covering 2.3 Acres of land. The park has been established within a period of one year only.

8.6.2.1 Renewal Energy sources

Uttarakhand has a huge potential for Hydropower. In the concerned area, there are four Hydro-generating power houses. These generating systems are controlled by Uttarakhand Jal Vidyut Nigam Limited, Dehradun. The biggest generating unit is Khodri Power House having four 30 MW units. Other power houses are located in Dhak-Rani, Dhalipur and Kulhal. All the four power houses are connected by 132 kV line which are further connected to other sub stations in the development area.

Table 8-18: Daily Hydro-Power Generation Report in Doon Ghati Area, August 2011

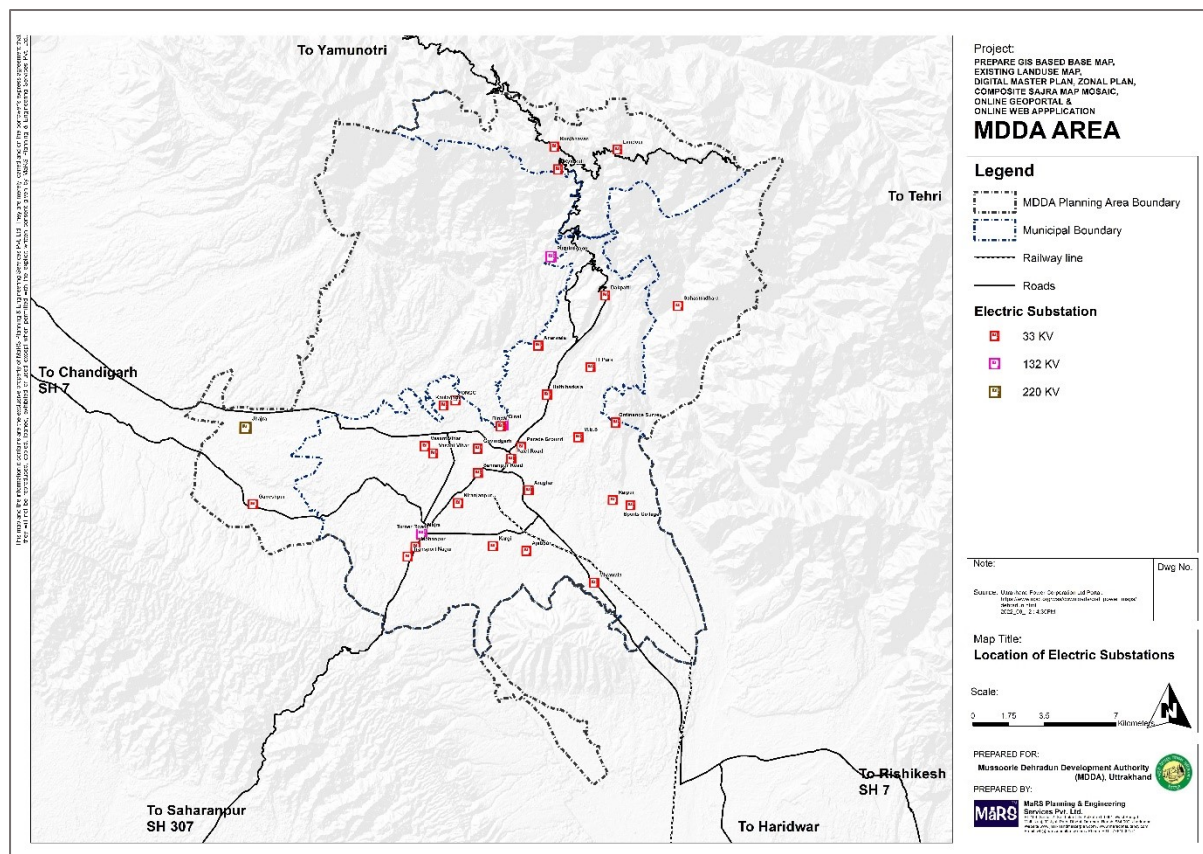
Sr no	Name of Power Station	Capacity (MW)	Generation of the Day (MU)					Cumulative Gen. of the Month till date (MU)	Cumulative Gen. in FY till date (MU)	Average Tunnel/ Power Channel Discharge (Cumecs)	Probable Generation as per availability of water Less of Loss of Generation	according to water Availability
			Unit- 1	Unit- 2	Unit- 3	Unit- 4	Total					
1	Chibro	240	1.03	1.20	1.22	1.16	4.61	4.61	357.87	198	4.75	0
2	Khodri	120	0.44	0.49	0.51	0.53	1.97	1.97	162.54	198	2.15	0
Tons River Total							6.58	6.58	520.41		6.90	
3	Dhakrani	33.75	0.25	0.24	0.26		0.76	0.76	62.89	198.24	0.79	0
4	Dhalipur	51	0.36	0.35	0.41		1.12	1.12	94.63	198.24	1.15	0
5	Hulhal	30	0.14	0.17	0.15		0.45	0.45	60.49	126.76	0.44	0.239
Yamuna River Total							2.33	2.33	218.01		2.39	

Source: UJNV Limited, Dehradun

8.6.3 Electricity Network Coverage Area

In Dehradun city all wards are covered with power supply connections with the tariff between Rs 4 and 6 per unit, and the wards have variation in power supply they have 1 to 2 cuts in a day of 15-20 mins.

Map 8-12 : Electricity Network coverage area



8.6.4 Street lightings

The present new wards have sodium bulbs which consume lesser energy. Also, DMC will soon install 40 Led lights in the new wards. Around 60000 new street lights are expected to be installed.

8.6.5 Gap Analysis

Requirement of more street lights with the population increase and development, especially in streets to reduce black spots in the city and increase safety, especially for women and children.

8.6.6 Projected Requirements

By the year 2041, whole Dehradun area will be requiring electricity supply lines (both existing and proposed roads)

8.7 TELE-COMMUNICATION

8.7.1 Telephone Exchange

Dehradun city core area markets are filled with all kinds of smart phones and other electronic items and people are easily accessible to buying these technologies.

8.7.2 Television and Radio Stations

With the ease of access to technology. Almost every household has a television, particularly HIGs and MIGs. These households also consume the most other electronic items, such as laptops, phones, and smart appliances. Dehradun also has a Dehradun Kendra, which is near the Rispana Bridge.

8.7.3 Telephone Lines

Dehradun Smart Cities Limited (DSCL) and Indus Towers, one of the world's largest telecom tower companies, have partnered on a Public Private Partnership (PPP) model to install 70 ground-based mast telecom sites, 60 Smart Poles and deployment of 100 km of Underground Fiber Network.

8.7.4 Optic Fibre Distribution

DSCL with the PPP model has also proposed to installed 60 Smart Poles and deployment of 100 km of Underground Fiber Network. The project entailed installation of 60 Smart Poles equipped with WiFi access points, Smart lighting solution (warm LED lights consuming lesser energy) and CCTV cameras (for video surveillance) in Dehradun.

8.7.5 Gap Analysis

Few new areas on the outer side of the city like Gullar Ghati, still does not have optic fibre distributions and cannot get wifi connections

8.8 CNG AND PNG

8.8.1 Piped Natural Gas Distribution

Piped natural gas line is still under processed. The main core area of Dehradun city has been installed gas connections but the work is still going on.

8.8.2 CNG Distribution

Presently 6 CNG Pumps are Operated. A proposal was prepared by GAIL Gas Limited to build 16 CNG pumps in the Dehradun district. At present, six CNG pumps are operating. Out of this, three pumps were operated last month at Haridwar Bypass, Doiwala and Rishikesh. Whereas CNG pumps at Malsi, Race Course and Sahastradhara Road have been in operation since much earlier. 90% work of these pumps is completed.

8.8.3 Gap Analysis

Since, CNG is a new concept for the city. It is still being under processed and only being installed in major core areas at this point.

8.9 ISSUES AND POTENTIALS OF PHYSICAL INFRASTRUCTURE

8.9.1 Water Supply

- A detailed assessment of existing situation was carried out, which concludes that the present water production is not sufficient to meet water demand and the present inadequacy in the water supply system, is due to (i) poor water management, (ii) old and leaking distribution system and (ii) inadequate water treatment facility. These issues need to be addressed immediately to provide water supply to the citizens of Dehradun as per the National standards.
- In Dehradun, urbanization also results into surface water changes such as:
 - loss of 18% seasonal stream
 - Loss of 60% seasonal water bodies which is converted into the land
 - Loss of 1% of the permanent water bodies
- Around 90% HH's are having in-house Water Supply Connection.
- No Water Metering System is available for measuring the water distribution and consumption at HH level.
- Water Supply is more than sufficient for the current population demand. But, due to the older water supply network, water losses are quite high into the region.
- Out of total water supply, more than 80% is through the ground water sources.
- Tributary of Yamuna River which passes from the west portion of Dehradun is completely dried. There is a huge requirement for Surface Water Recharge and its related projects into the region through River Development Projects.
- Existing Water Treatment Plants are old and hard water is being produced as water softening plant arrangement does not exist.

- Quality of Water is really bad into the region which may results into skin and hair related diseases.
- Proposal for Drinking Water, Water Supply System and Water Metering are already in pipeline.

8.9.2 Storm Water Drainage

- Due to its hilly terrain, the city has a natural gravity-based drainage system with sufficient gradients to drain off storm water easily into the two main natural drainage channels i.e. rivers Bindal and Rispana.
- Most of the drains are ill maintained, damaged and dumped with municipal solid waste. Dumping of garbage, particularly plastics cause serious reduction in waterways of main drainage channels.
- Encroachment on natural drains is creating issues related to water logging especially into the low lying areas.
- Excluding National and State Highways, other major roads are either not having road side drain or have insufficient drain size. For improving the storm water management within the city, it is essential to construct the storm water drain.

8.9.3 Sewerage and Sanitation

- Due to the absence of sewer lines & its integration and unavailability of STP's in the city, collected sewerage could not be treated and finally disposed into the drains or open grounds which leads to ground water contamination.
- Only 34 % HH's of the city is covered with the Sewerage Network
- In the old city area, sewerage lines are 40 – 50 Years old and have outlived their useful life and need to be replaced. Under the Smart City Mission, proposal of newer sewer lines are already given into these areas.
- Most of the Manholes are into the Dilapidated Condition
- Sewers get choked often and their sewage is diverted into nearby open drains and nalas at many places. Due to that reason, Sewerage reaches the Sewage Treatment Plants (STPs) partially and their full treatment capacity is underutilized.
- The present working capacity of the installed STP's are nearly 35% as against the total working capacity.
- Most of the Public/ Community toilets are functional, have proper electricity & water supply but poor operation and maintenance services.

8.9.4 Solid Waste

- Maximum HH are covered with Doorstep Dustbin Facility
- Solid Waste Daily Collection Efficiency is around 70%
- Treatment Capacity is around 60%
- Waste Segregation at source level is not practiced
- Waste Segregation at disposal site is also less
- Proposals are there under the Smart City Mission Solid Waste Management
- There are major issues of waste segregation at the source and the site. Without segregation, waste is transferred to the recycling plant hampering the efficiency and quality of the machine.
- The present collection system is irregular, ineffective and inefficient. A significant part of the waste is left unattended. This waste not only degrades the environment but also blocks stormwater drains.
- No major initiatives have been taken so far by the DNN to educate people on the ill effects of the haphazard disposal of solid waste.
- Requirement for Proper routing of vehicles for transportation of waste to the disposal site.
- Maximum households are covered with doorstep dustbin facility and solid waste daily collection efficiency is around 70%.
- Waste Transfer Station to minimise time and distance of travel of the solid waste transport vehicles. This will reduce the cost of transportation and increase the efficiency of the vehicles.
- Proposals are there under the Smart City Mission Solid Waste Management

9 SOCIAL INFRASTRUCTURE PROFILE

9.1 INTRODUCTION

Social Infrastructure consist of Education facilities, Health facilities, socio-cultural facilities, police, fire, postal services, telecommunication and

9.2 EDUCATIONAL FACILITIES

Since the British period the town became a major academic and research centre and a base for the Indian Military Academy and the Survey of India. There are also several prestigious academic schools, institutes and research centres such as Forest Research Institute which is main centre of research and planning in the field of flora and fauna in India, Indian Petroleum Institute, Central Soil and water conservation, Doon School, India's most expensive private school and many other who attracts the national and international students.

When compared to the district and state literacy rates, the city has a high literacy rate of 88.36% due to its massive number of educational institutes. City residents do not migrate to other cities for education because they have prestigious institutes in their immediate vicinity, and the city itself provides a good education service.

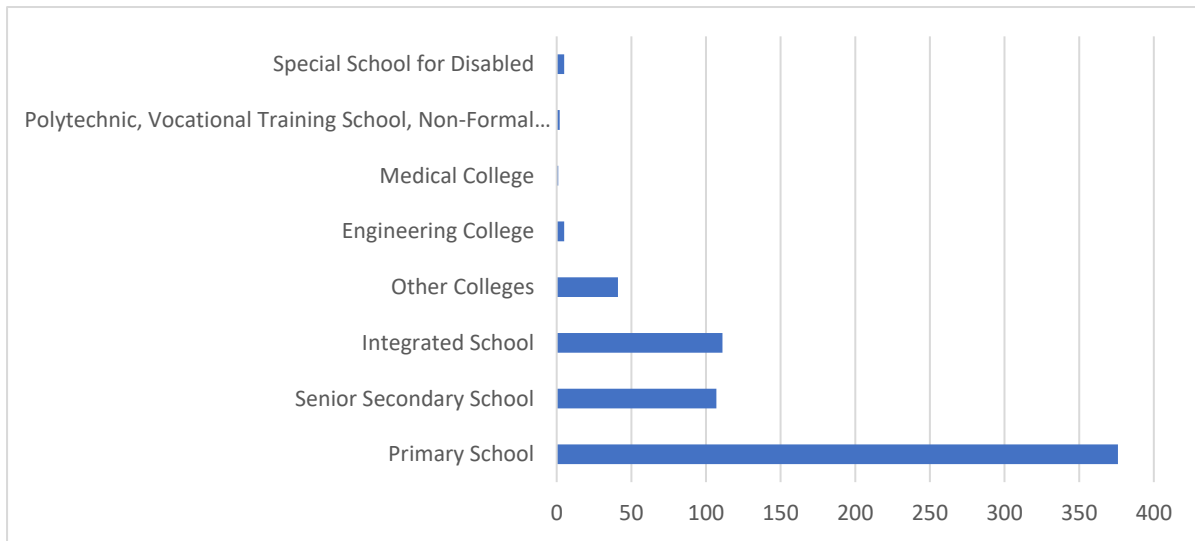
9.2.1 Hierarchy of educational facilities

The census data shows that educational facilities are primarily present in urban centres of Doon valley region. However, undeveloped areas have shown a large improvement since the last 30 years. Primary education is fairly available in nearly all villages but there is need to setup many higher education institutes.

Table 9-1: Existing Education facilities in Planning Area

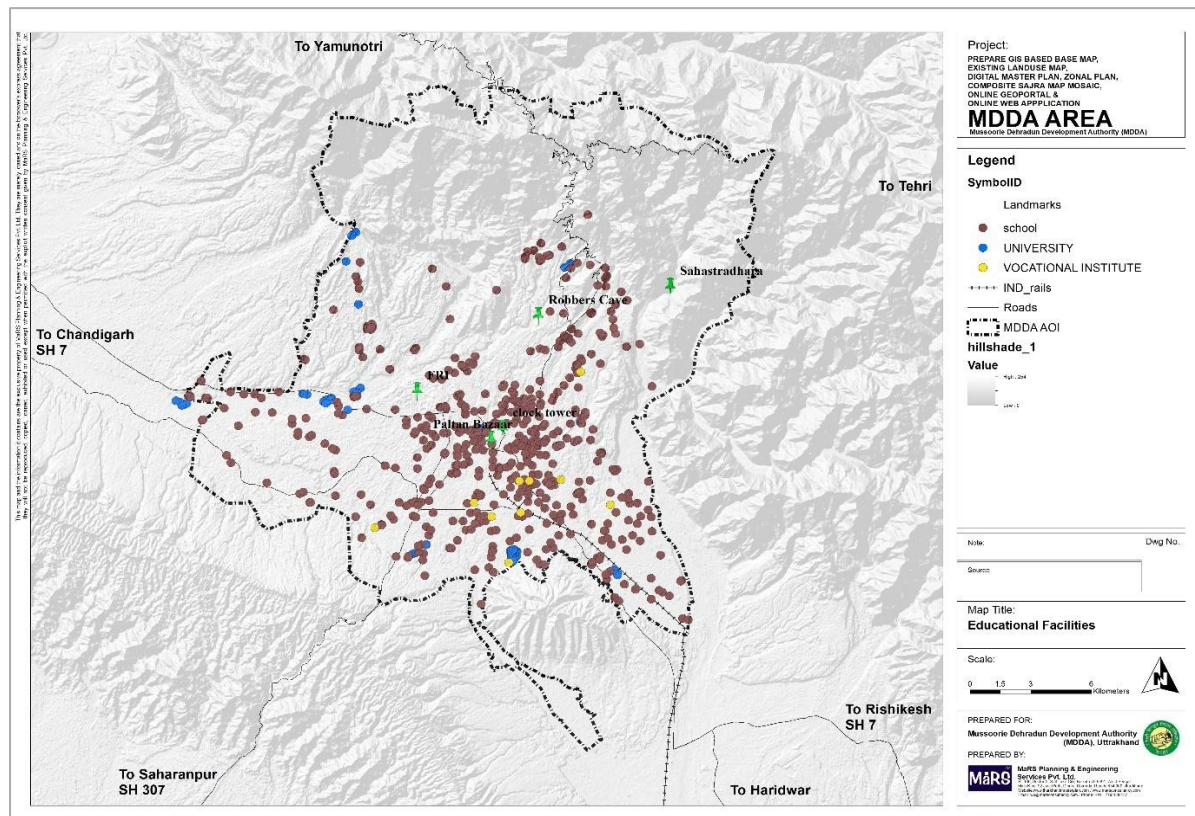
Sr. No.	Category	Population served per unit (URDPFI Norms)	Existing Facilities (No.)	Gap, if any (No.)	Additional Requirement (No.)	Area Requirement (Ha.)
1	Primary School	5000	376	0	104	41.60
2	SSC School	7500	107	20	213	383.40
3	Integrated School	1,00,000	111	0	0	0.00
4	Other Colleges	1,25,000	41	0	0	0.00
5	Engineering College	10,00,000	5	0	0	0.00
6	Medical College	10,00,000	1	0	2	30.00
7	Polytechnic, VT,NFT	10,00,000	2	0	1	4.00
8	Special School for Disabled	45,000	5	16	48	33.83
	Total					492.83

Graph 9-1 : Existing Education facilities in Planning Area



Source: Census of India, 2011

Map 9-1: Distribution of Educational Facilities in the area



According to the URDPFI standard, at present there is a requirement of 480 primary schools, but currently there are 376 primary schools operating. 320 senior secondary schools are required, of which 107 schools are currently running. According to the current requirement, the city requires 104 additional primary schools and 213 additional senior secondary schools to serve the planning area population. As per the URDPFI standard for Dehradun city, the number of integrated schools, other colleges, and engineering colleges is greater and city has surplus of all three education services. In higher education, the city required two more medical colleges, one polytechnic, a vocational training school, a non-formal training centre, and 48 additional special schools for disable people to cater the population of planning area.

9.2.2 Gap Analysis

The city has a prestigious Indian institute, but primary level schools lag behind; there is a significant need for primary-primary and higher secondary schools. Basic education level services are lacking here, while the city caters to the entire country with national level prestigious institutes.

9.2.3 Demand Projections

Being a main centre for learning. Additional numbers will be required in the sectors of primary school, senior secondary school, medical college, polytechnic, and school for the disabled to meet the projected population. Approximately 500 ha. for educational amenities for the projected population will be required.

Details of the Education facilities under Dehradun Area are given into the table below.

Table 9-2 : Additional Educational services to be proposed in Dehradun planning area for 2041

Sr. No.	Category	Existing No.	URDPRI Standards (Population served per unit)	Current Requirement as per URDPFI Norms	Future Requirement - As per URDPFI Norms	Additional Requirement for 2041
1	Primary School (I to V)	200	5000	115	439	239
2	Senior Secondary School (VI to XII)	153	7500	77	293	140
3	School for Physically Challenged	5	45000	13	49	44
4	Technical Education - ITI	2	1000000	1	2	0
5	Engineering College	2	1000000	1	2	0
6	Medical College	1	1000000	1	2	1
7	Other Professional College	18	1000000	1	2	0

Source: Census 2011 and Consultant Analysis

9.3 HEALTH CARE FACILITIES

9.3.1 Hierarchy of health care facilities

Dehradun is an important medical centre in addition to being the administrative capital. There are numerous high-level national medical and training institutes in the planning area. According to a survey conducted by the municipal corporation and the Mussoorie Dehradun Development Authority, there are currently 23 state hospitals in the Dehradun Municipal area, with a total of 124 hospitals under the planning area, including government, institutional, and individual nursing homes. This includes 1700 beds, 267 doctors, 915 assistants, and 20 patient vehicles. When compared to the URDPFI guidelines, there are still insufficient medical facilities available in both urban and rural areas.

According to the above table, there is a huge demand for dispensaries, primary health centres, polytechnics, and family welfare centres in the planning area, as well as non-government hospitals and veterinary hospitals, among other things. There are many private hospitals in the planning area that are prohibitively expensive for the general public, and the government hospitals are inadequately equipped to serve the Dehradun district's rural and urban populations. There is a need to increase the quantity and quality of health infrastructure for city residents that is both accessible and affordable.

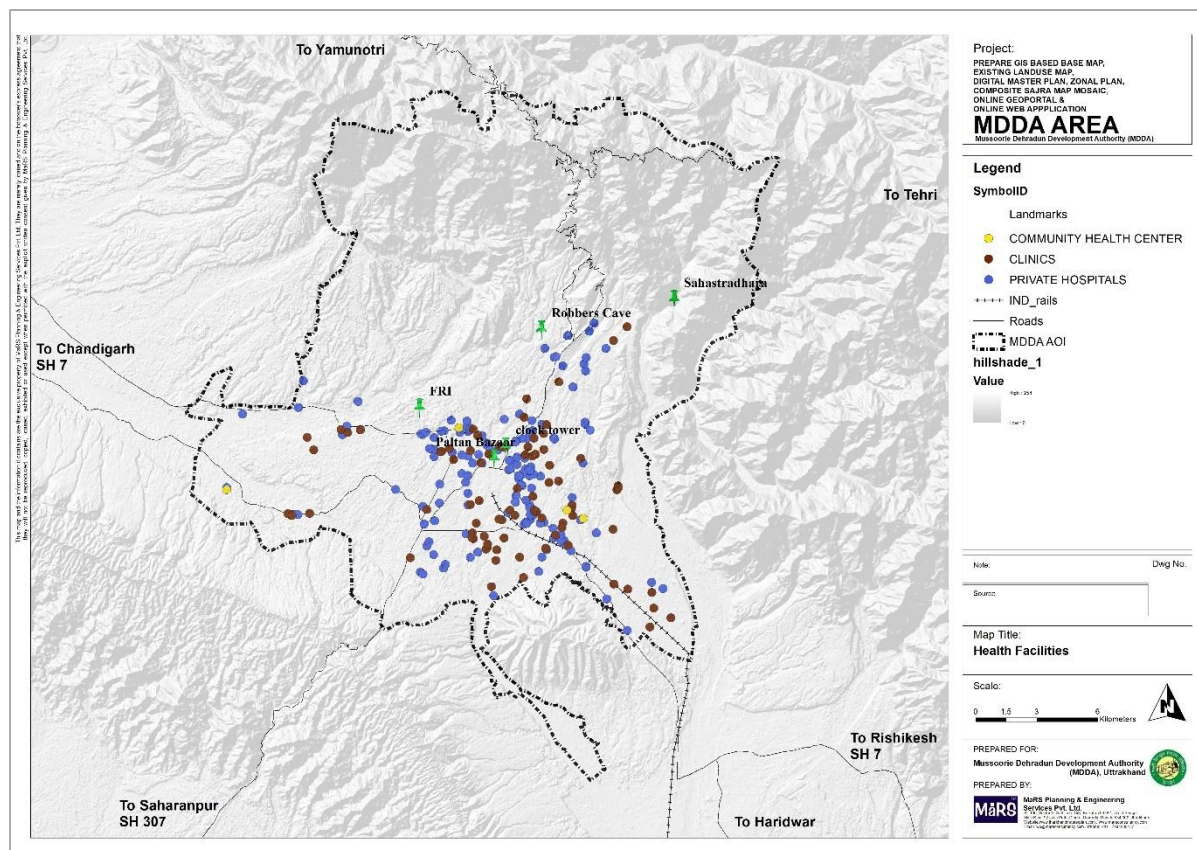
9.3.2 Distribution of Health Services

There are many private and public hospitals located in the city to cater the planning area population, but they are concentrated in the city centre. The private hospitals include Max Hospital on Rajpur Road, City Heart Hospital (Multi speciality hospital) on EC Road, Synergy Hospital on Ballupur Chowk, and Indresh and CMI Hospital on Ara Ghar. There is one Uttarakhand ayurvedic university that provides ayurvedic medical services and is also located in Harrawala.

Table 9-4: Existing Health services and additional Health services required for planning area, 2021

Sr. No.	Category	Population served per unit (URDPFI Norms)	Existing Facilities (No.)	Gap, (No.)	Additional Requirement (No.)	Area Requirement (Ha.)
1	Dispensary	15,000	10	53	150	18.00
2	Primary Health Centre	20,000	11	36	109	16.35
3	Nursing home, child welfare and maternity centre	45,000 – 1,00,000	23	0	1	0.30
4	Polytechnic	1,00,000	7	2	17	5.10
5	Family Welfare Centre	50,000	14	5	34	1.70
6	Other Non – Government Hospitals	1,00,000	126	0	0	0.00
7	Veterinary Hospitals	5,00,000	6	0	0	0.00
						41.45

Map 9-2 : Distribution of health facilities in the area



9.3.3 Gap Analysis

All medical services are not distributed equally in the planning area; they are concentrated in the city centre. the city lacks an adequate public transportation system, making it difficult for people from the outskirts to access medical services in the city centre. Aside from that, despite the city's has high-quality health services, it lacks basic health services such as a dispensary, community health centre, and primary health centre in accordance with the URDPFI standard to serve the planning area's population.

9.3.4 Demand Projections

For the projected population, additional no. will be required into the sector of dispensary, primary health centre, nursing homes, polytechnic, and family welfare centre. Around 50 Ha. of land will be required for medical amenities for the projected

Table 9-5 ; Additional Health Facilities to be proposed in Dehradun Planning Area in 2041

Sr. No.	Category	Existin g No.	URDPRI Standards (Populatio n served per unit)	Current Requiremen t as per URDPFI Norms	Future Requiremen t - As per URDPFI Norms	Additional Requiremen t for 2041
1	Dispensary	5	15000	38	146	141
2	Family Welfare Centre	12	50000	11	44	32
3	Maternity and Child Welfare Centre and	54	100000	6	22	0

Sr. No.	Category	Existin g No.	URDPRI Standards (Populatio n served per unit)	Current Requiremen t as per URDPFI Norms	Future Requiremen t - As per URDPFI Norms	Additional Requiremen t for 2041
	Nursing Homes					
4	Allopathic Hospital	3	100000	6	22	19
5	Veterinary Hospital	2	500000	1	4	2
6	Not Governmen t - Charitable Hospitals	47	100000	6	22	0

Source: Census 2011 and Consultant Analysis

9.3.5 Issues and Potentials:

- Though the number of health facilities to the total population is not sufficient, there distribution is not uniform.
- In order to serve the large local population base and a huge floating population, there is a need to improve the health facilities.

9.4 POSTAL AND OTHER SERVICES

9.4.1 Character and distribution of postal services

The hierarchy of post offices are at three levels which is city and sub city , district and community level. The Planning area has post offices in both Urban and Rural areas. The post office is of three different categories which are Head Post Offices, Departmental Sub Post Offices and also Branch Post Offices.

Table 9-6 : Existing Total Post Offices in the planning area

Sr. No.	Category	Population served per unit (URDPFI Norms)	Existin g Faciliti es (No.)	Existi ng Gap	Additional Requireme nt (No.)	Area Requireme nt (Ha.)
1	Post office counter without delivery	15000	39	24	109	1
2	Head post office with delivery office	2.5 lakh	5	-	4	0.3
3	Head post office and administrative office	5 lakhs	-	1	4	1
						2.3

Source: Doon Ghati Master Plan

Map 9-3 : Distribution of Post Offices in the area

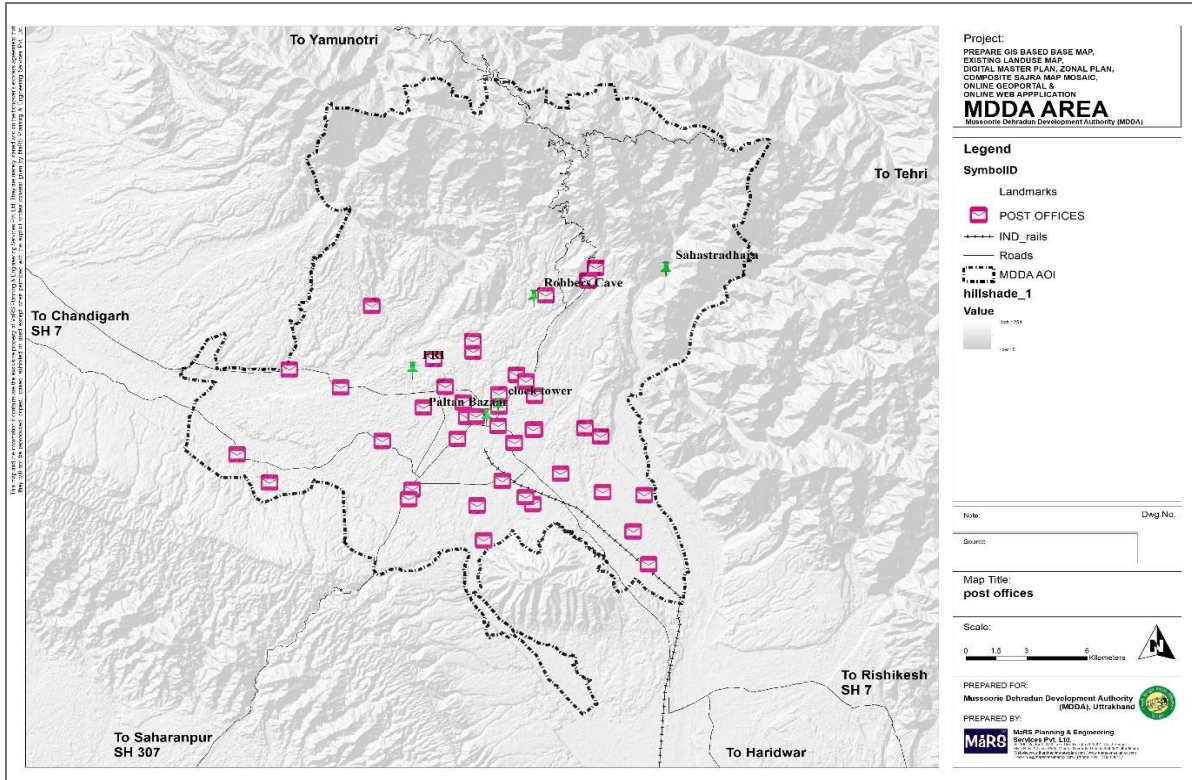


Table 9-3: Future Requirement in Post Office

Sr. No.	Category	Existing No.	URDPRI Standards (Population served per unit)	Current Requirement as per URDPFI Norms	Future Requirement - As per URDPFI Norms	Additional Requirement for 2041
1	Post office counter without delivery	39	15000	38	146	107
2	Head post office with delivery office	5	250000	2	9	4
3	Head post office and administrative office	—	500000	1	4	0

9.4.2 Character and distribution of banking services

There are a satisfactory number of banks in urban centres along with the number of agricultural credit societies. The blocks of Dehradun district have a sufficient number of banks and credit societies. However, blocks of Tehri district do not have satisfactory banking facilities for a population of 35,438 persons. Distances to banks and credit societies in these villages are 2 km on an average.

Map 9-4 : Distribution of banks in planning area

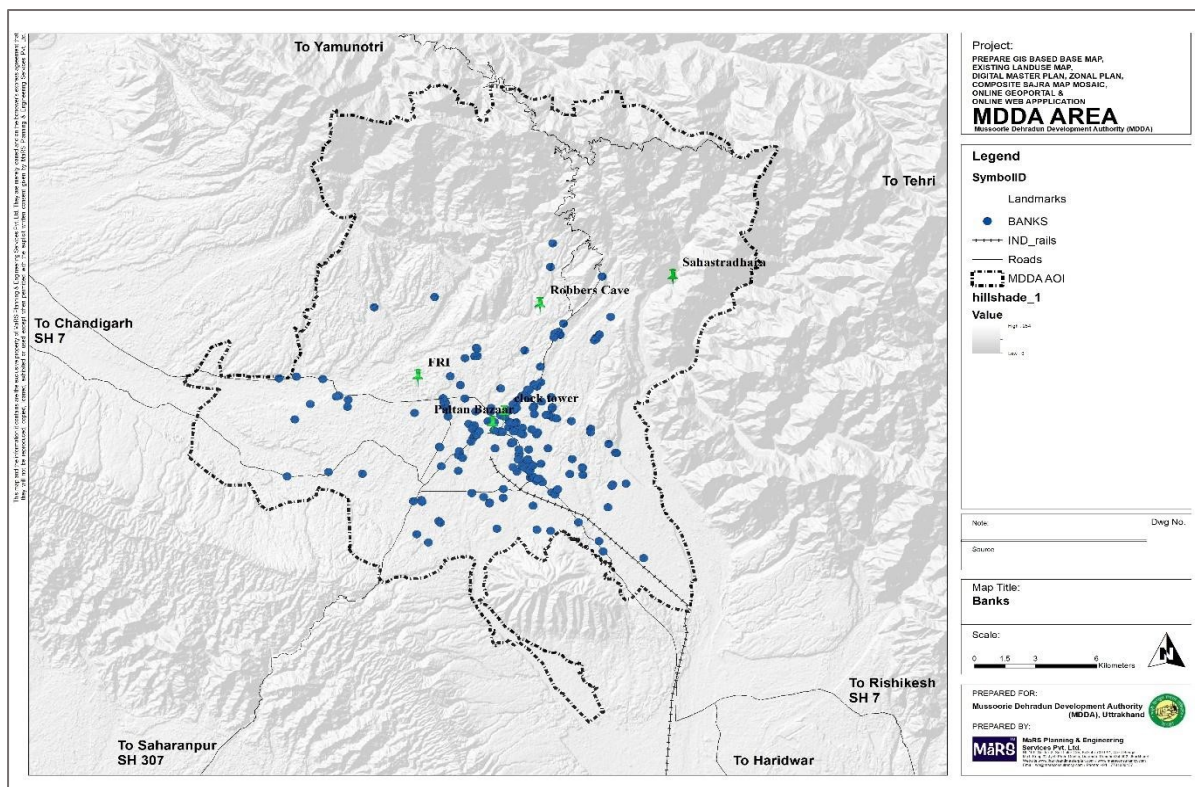


Table 9-7: Available Bank Facility

Sr. No.	Category	Population served per unit (URDPFI Norms)	Existing Facilities (No.)	Gap, if any (No.)	Additional Requirement (No.)	Area Requirement (Ha.)
1	Bank with extension counters with ATM facility	15000	193	-	-	-
2	Bank with locker, ATM and other banking facilities	1 lakh	3	6	19	5
						5

Source: Primary Survey and Consultant Analysis

Table 9-4: Future Requirement in Banking Sector

Sr. No.	Category	Existing No.	URDPFI Standards (Population served per unit)	Current Requirement as per URDPFI Norms	Future Requirement - As per URDPFI Norms	Additional Requirement for 2041
1	Bank with extension counters with ATM facility	193	15000	38	146	0

Sr. No.	Category	Existing No.	URDPRI Standards (Population served per unit)	Current Requirement as per URDPFI Norms	Future Requirement - As per URDPFI Norms	Additional Requirement for 2041
2	Bank with locker, ATM and other banking facilities	3	100000	6	22	19

9.4.3 Existing issues and Potentials

1. While there are a lot of post offices that could cater to the current population. There is more requirement for Post Office counter without delivery to cater to the existing population for courier and speed post services.
2. There will be requirement for additional 119 post offices which could cater to the future population.
3. There are more than sufficient banks in the planning area, hence there is no gap or additional requirement for the same.

9.5 SOCIO-CULTURAL FACILITIES

9.5.1 Religious Facilities

The capital city of Uttarakhand with its pleasant climate throughout the year, makes it a very popular tourist destination in India. Moreover, this picturesque hill resort is also known for its various spiritual places and one can take many religious tours in Dehradun according to their convenience. The numerous temples in Dehradun make it a very popular place among pilgrims. Some of the worship places in Dehradun are Tapkeshwar Temple, Laxman Siddh Temple, Mind rolling Monastery, Ram Rai Gurudwara, St. Thomas Church, Jama Masjid etc to name a few. The temples are the best way to come across the art, culture and the architecture of the place.

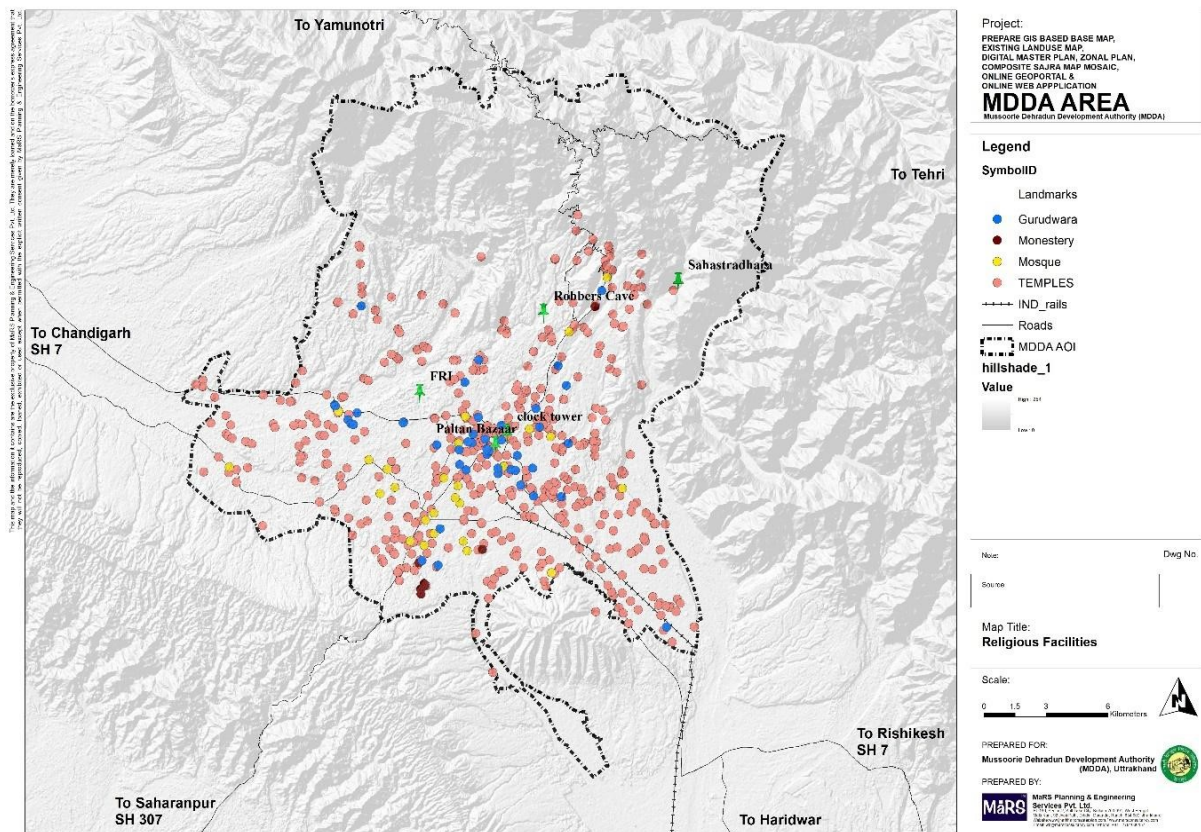


Table 9-8: Available of religious facility in the Dehradun Planning Area

Sr. No.	Category	Population served per unit (URDPFI Norms)	Existing Facilities (No.)	Gap, if any (No.)	Additional Requirement (No.)	Area Requirement (Ha.)
1	At neighbourhood / housing cluster level	5000	576	-	-	-
2	At sub city level in urban extension	10 lakhs	0	1	2	4
						4

Source: Primary Survey and Consultant Analysis

Map 9-5: Locations of Religious facilities in Dehradun



9.5.2 Fairs and cultural activities

One of the famous cultural activities is Tapkeshwar Mela, Laxman Siddha Fair, Shaheed Veer Kesri Chandra Fair and Virasat Trade Fair, where many small and medium businesses inside and outside the city come together on the government allotted grounds and sell their artistic items like handicrafts to the public. the shop owners put up their stalls and pay fees for booking and registrations to the government. Fairs like Shaheed Veer Kesari even put-up entertainment things like- rides and games to attract more people, which leads to more revenue generation. Some fairs even organise ritual activities like pooja and artis. The events are done during festival times like Shivratri and other Hindu e vents.

Figure 9-1 : Various Fairs and Festivals in Dehradun



9.5.3 Community Halls

Community halls are public locations where members of a community tend to gather for group activities, social support, public information and other purposes. They may sometimes be open for the whole community or for a specialised group within the greater community. Community centers can be religious in nature, such as Christian, Islamic, Hindu or Jewish community centres, or can be secular such as youth clubs.

Figure 9-3: Community Centres in the Planning Area



The community centres are used for celebrations, public meetings of the citizens on various issues, volunteer activities, weddings organising local non-governmental activities etc. The MDDA area has a total of 21 community halls spread across the area. Few of the examples for the same are Tehri community centre, Umanjali Bhavan, Jhinkwan Bhavan, Defence Colony Community centre, Community Hall Cantt. Board Clement Town.

Table 9-9: Existing community halls in the Dehradun Planning Area for 2021

Sr. No.	Category	Population served per unit (URDPFI Norms)	Existing Facilities (No.)	Existing gap (No.)	Additional Requirement (No.)	Area Requirement (Ha.)
1	Community Room	5000	18	171	427	32
2	Community hall, barat ghar/Library	15000	3	60	145	147
						179

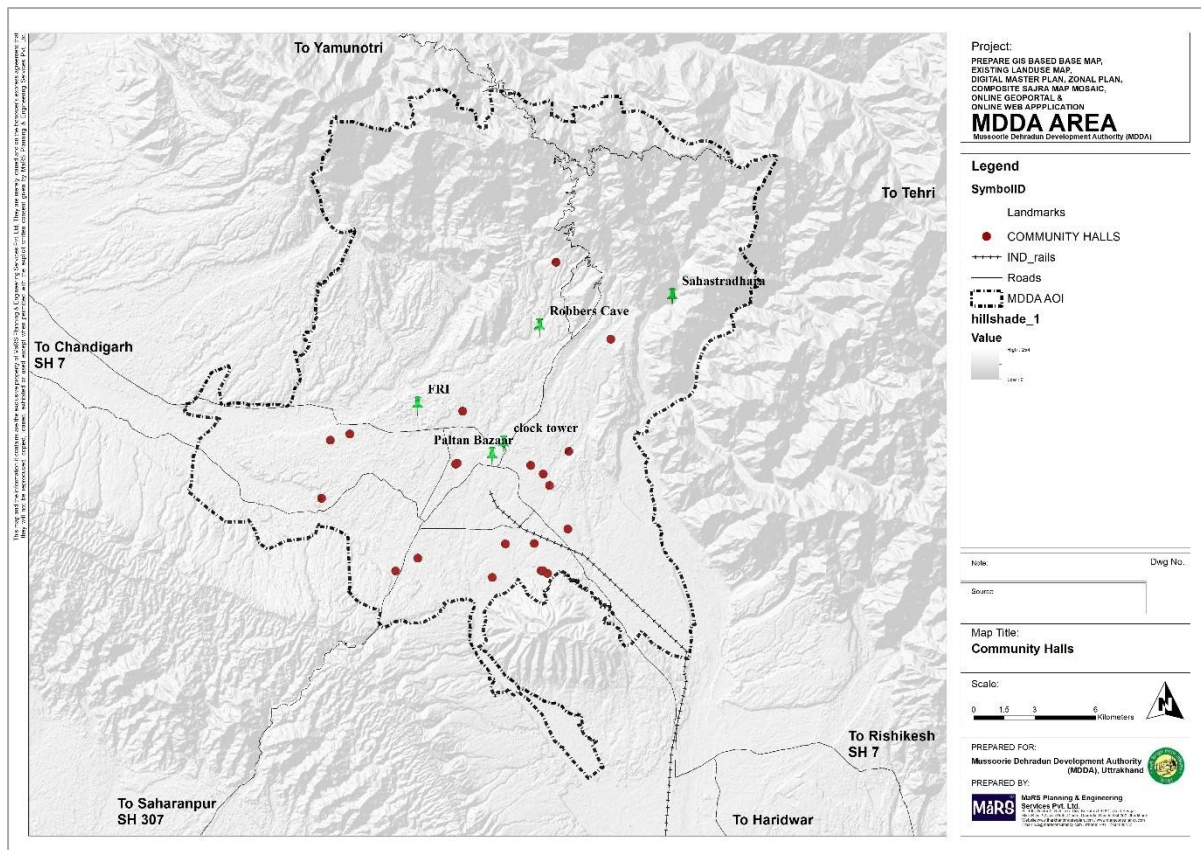
Source: Primary Survey and Consultant Analysis

Table 9-5: Future Requirement of Community Halls

Sr. No.	Category	Existing No.	URDPRI Standards (Population served per unit)	Current Requirement as per URDPFI Norms	Future Requirement - As per URDPFI Norms	Additional Requirement for 2041
1	Community Hall	16	15000	38	146	130

Source: Census 2011 and Consultant Analysis

Map 9-6 : Locations of Community halls in Dehradun



9.5.4 Arts and crafts

The splendid city of Dehradun is a treasure-house of exquisite and cultural handicrafts that have earned enormous recognition all over the world. The exemplary craftsmanship of the skilled artisans of the city can be witnessed in the form of magnificent paintings, wood carvings, Aipan folk art, premium jewellery pieces and much more. These handpicked crafts are the perfect testimony to the city's rich and ethnic traditions.

1 Wood Carvings

Exquisite woodwork has been native to Dehradun since time immemorial. There are various factors that have helped, such as availability of timber, suitable temperature for wood insulation, easy availability of skilled labour and dominance of family tradition that has led to the growth and development of this craft in the city. Gorgeously carved wooden items such as animal figures, miniature models of famous temples, idols of deities, etc. are some of the popular handicrafts made by the expert artisans of Dehradun.

2 Murals and Paintings

A Mughal ruler, Prince Suleman Shikoh, brought the art of painting to this city, which is primarily the reason why all paintings carry a deep Mughal influence. These paintings and murals showcase the grand cultural heritage of the city. They are generally made on paper, walls and pieces of cloth and are quite popular among art aficionados.

3 Aipan Folk Art

Aipan is a traditional form of painting which is particularly widespread in Dehradun. The art has immense cultural, social, and religious significance, and is popularly drawn at the entrances of houses and places of worship. It is done with a special solution made from rice paste mixed with ochre. You can come across several souvenirs in Dehradun with Aipan Folk art drawn on them, including files and folders, wooden paintings, cloth fabrics, utensils, etc. Carry back one of these to cherish a unique souvenir of Dehradun forever, or gift it to a loved one.

4 Woollen Garments

Famous for its cold to chilly weather, the city of Dehradun has a great altitudinal placement that offers ideal climatic conditions for animals such as Pashmina goats, sheep, and Angora rabbits. Consequently, some of the finest quality of wool is available in the region that is used to create exceptional woollen products, such as kaaleen, thulma (thick blanket), pankhi, chutka, and much more.

5 Ornaments

Dehradun is home to several skilled traditional artists and goldsmiths who have acquired a distinctive place in the national handicrafts market for crafting conventionally exquisite ornaments. This is a popular form of art prevalent in the city. You can easily find an extensive variety of intricately fashioned gold, silver and copper ornaments here. Apart from these, one can find some premium handmade utility items such as utensils as well as some beautiful forms of embroidery. All these superior products showcase the city's opulent historical influences.

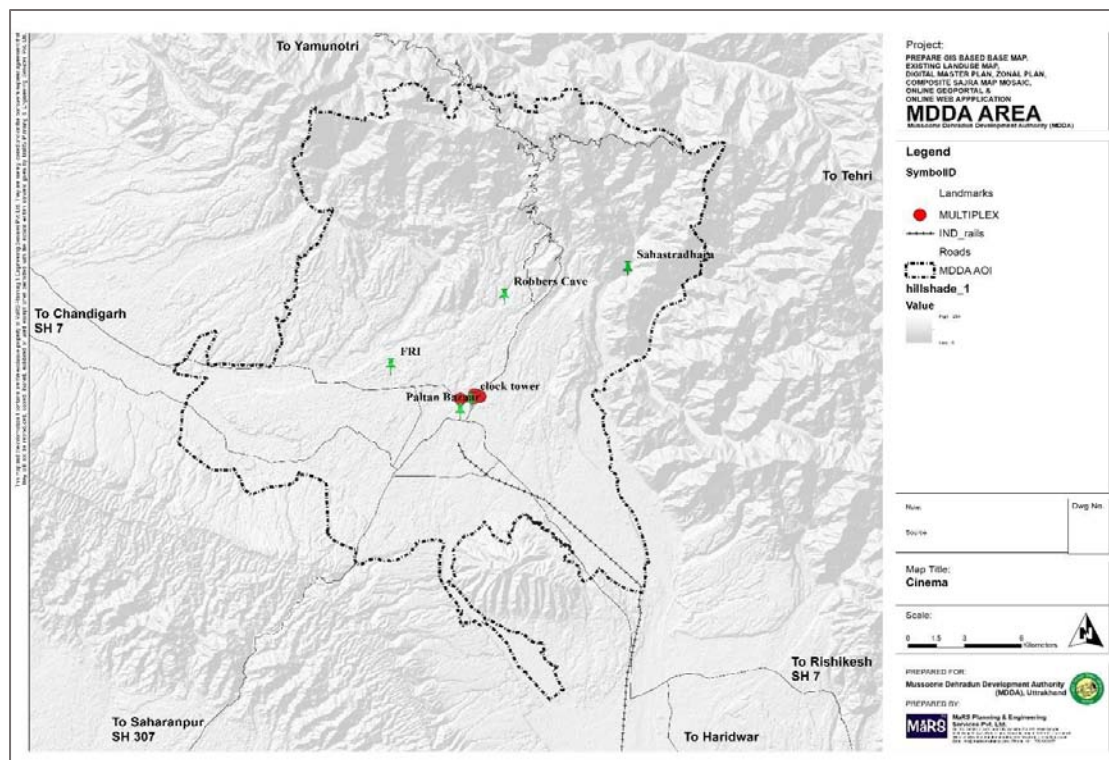
Figure: 1 Art and Craft in Dehradun



9.5.5 Cinemas and theatres

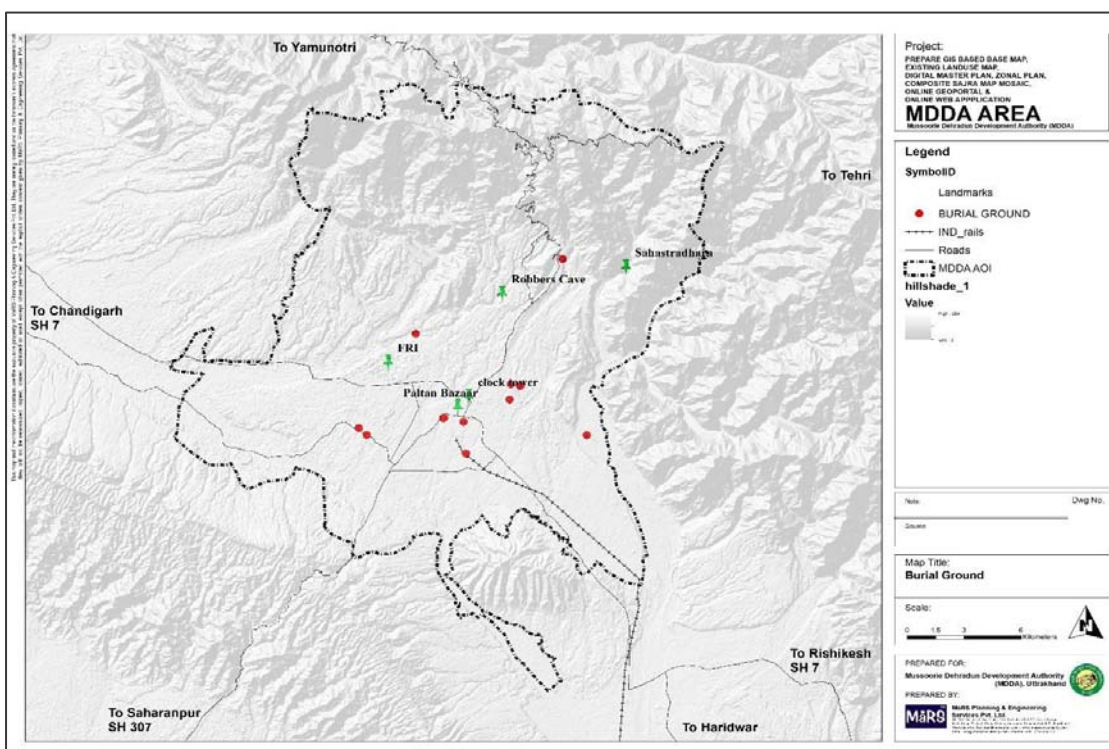
There are two kinds of theatres in Dehradun city. The first is double-screen movie theatres and cinemas in big malls and entertainment areas. A few of them are- the Pacific mall at Rajpur Road, Vikas mall at Vasant Vihar, Glits near ISBT etc. Apart from the big entertainment areas, the city still runs single screens like-Natraj, Orient and New Empire, from old times in the core area of Rajpur and Chakrata roads.

Map 9-7 : Multiplex in the area



9.5.6 Cremation and Burial Grounds

Map 9-8 : Locations of Cremation or Burial grounds



9.5.7 Issues and Potentials

1. There is no gap found in the number of religious places. As per the existing scenario there would be no requirement in future for the same as the numbers of religious places will be able to cater to the future population as well.

2. Although community halls are very important for all cities, Dehradun lacks in providing the required community halls. The existing facilities are far more less than what is required for a city with population around 20 lakhs.
3. Dehradun has a very rich cultural importance which can be seen through various fairs and festivals that are celebrated here along with its diversity in art and craft practiced here.
4. The number of burial grounds and cremation are sufficient in Dehradun and can also cater to the future population.

9.6 SAFETY AND SECURITY

9.6.1 Police

The presence of a police station can make a community or neighbourhood safer, regardless of what's inside it. It ensures public order, does investigation of crimes and performs innumerable other tasks. The Police Station is also the primary point of communication between the citizen and the police. Dehradun has a total of 29 police stations.

Dehradun city is facing acute pressure of vehicular traffic on the roads, which are already narrow due to lack of planning in the past. As a result of the increasing vehicular traffic in Dehradun, commuters are facing a lot of problems. The traffic situation is worsening in Dehradun every day. Poor design of intersections carrying high volume of traffic lead to traffic congestion during the peak hours. Maximum traffic congestion is observed into the Centre and Southern Part of the Dehradun the example of which are Clock Tower, Saharanpur chowk, Prince chowk in Dehradun.

Along with traffic congestion, a lot of accidents also happen in the city. Based on the information collected from the traffic police, the number of accidents and blackspots identified are discussed below:

Table 9-10 : Accidents in Dehradun

Year	No of accidents	No of deaths	No of injured
2013	296	138	274
2014	314	146	285
2015	343	143	303
2016	295	139	220
2017	342	132	143
Uptill 2018 March	75	26	53

Source: CMP Report Dehradun

Further, the black spots, which witness maximum accidents and are high risk zones for accidents because of the engineering default of the place are Law College, Krishna Nagar Chowk, Purani Chowk, Satyanarayana Mandir, IT Park, Shahastradhara etc. More details about the black spots and its locations have been mentioned in Chapter:13 of Traffic and transportation.

Map 9-9 : Locations of Police Stations in Dehradun

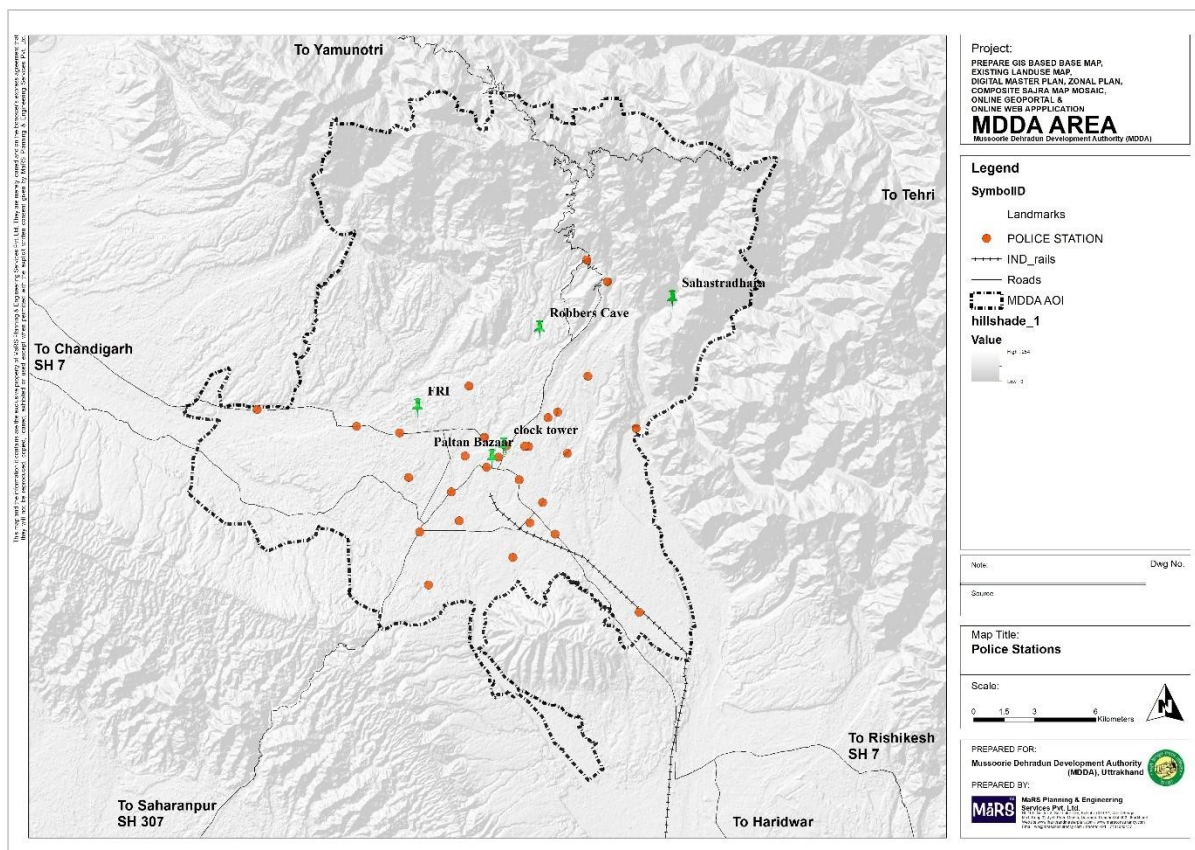


Table 9-11 : Existing and additional police stations required in the Dehradun Planning Area 2021

Sr. No.	Category	Population served per unit (URDPFI Norms)	Existing Facilities (No.)	Gap, if any (No.)	Additional Requirement (No.)	Area Requirement (Ha.)
1	Police Station	90000	29	-	-	-
						-

Source: Primary Survey and Consultant Analysis

Table 9-12: Additional police station required in 2041

Sr. No.	Category	Existing No.	URDPRI Standards (Population served per unit)	Current Requirement as per URDPFI Norms	Future Requirement - As per URDPFI Norms	Additional Requirement for 2041
1	Police Station	29	90000	6	24	0

Source: Primary Survey and Consultant Analysis

9.6.2 Law and Order

Dehradun police is for prevention and detection of crime, maintenance of law and order and efficient service delivery to citizens.

The focus is also to efficiently assist in rescue and relief operations during disasters. The department also on providing a safe and secure environment for investments and tourism in the state.

9.6.3 Existing Issues and Potentials

The present number of police stations are more than sufficient to cater to the existing as well as the future population but there is requirement for increasing the number of fire stations as they do not cater to the already residing population of Dehradun and will also be required in the near future for the increasing population.

9.7 FIRE PREVENTION AND PROTECTION

The urban areas of Doon valley do not have a fire fighting service presently. The nearest station is at Dehradun which is at a distance of 22 to 40 km from urban centres. Only 3.5% of the total area is served by the existing Fire stations and remaining 96.5% of the total MDDA area is unserved which means more fire stations are required to cater remaining population in the area. The region demands better fire service at least in urban areas otherwise a huge population would be in danger.

There is total five fire stations in the Dehradun district but only one in Dehradun city rest four are in Rishikesh, Mussoorie, Vikas Nagar and Selaqui industrial area respectively.

Map 9-10 : Locations of fire stations

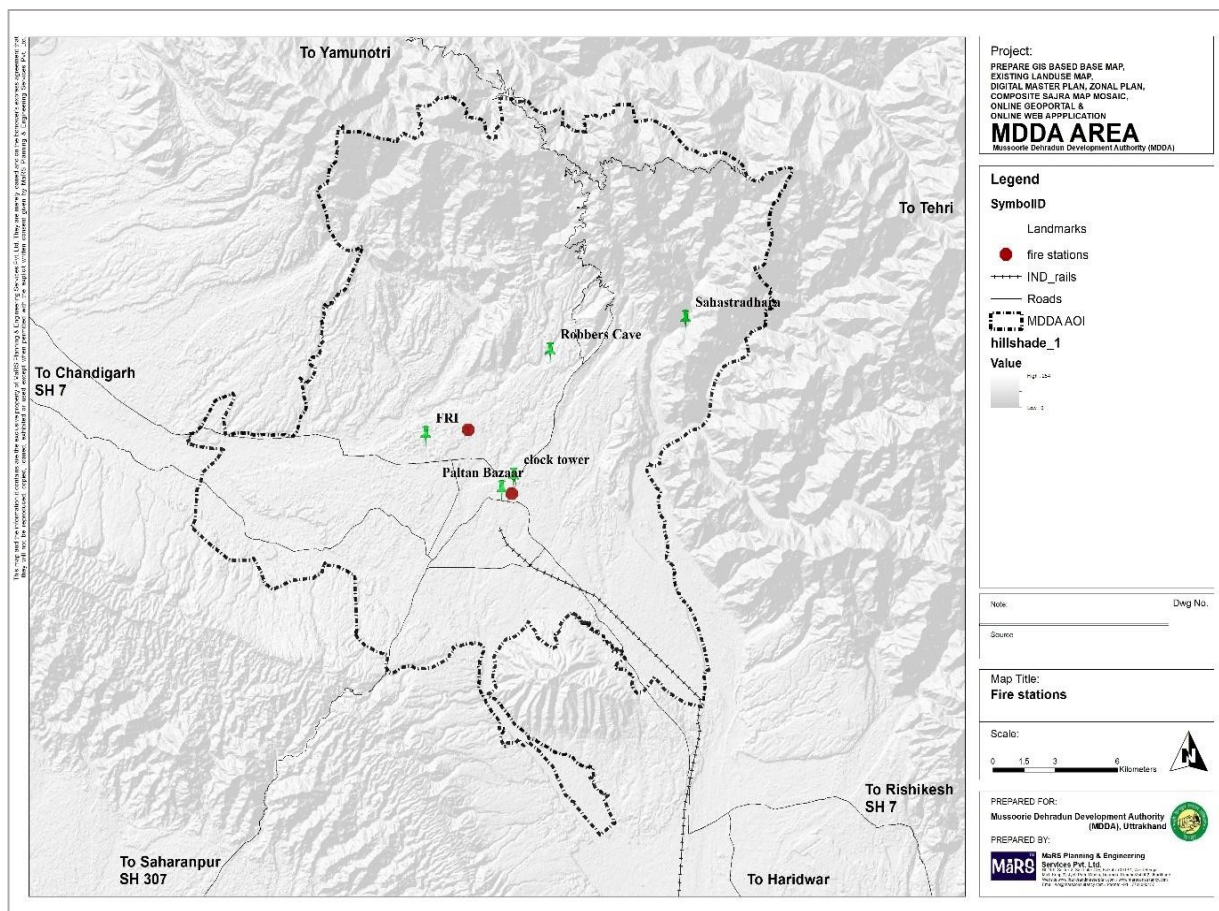


Table 9-13: Available and additional fire stations to be proposed in the Dehradun Planning Area

Sr. No.	Category	Population served per unit (URDPFI Norms)	Existing Facilities (No.)	Gap, if any (No.)	Additional Requirement (No.)	Area Requirement (Ha.)
1	Fire Station	2 lakhs	2	3	9	9
						9

Source: Primary Survey and Consultant Analysis

9.8 DISTRIBUTIVE SERVICES

9.8.1 Petrol Pumps

Dehradun has 71 petrol stations located at every corner of the city with some of them working 24 hours a day.

1.1.1. Filling Stations

Gas Authority of India (GAIL) has prepared a draft of network of pipeline gas supply and CNG station in Dehradun. For the proposed 50 CNG stations in Doon, three separate areas have been set up in the city.

- From ISBT Chowk, Dehradun to Rispna Bridge on Haridwar Bypass
- Rispna Bridge to Dehradun-Haridwar Road before Railway Overbridge
- From Divine Honda Showroom MDDA Office on Saharanpur Road

9.8.2 Public Distribution system

The Department of Food, Civil Supplies, and Consumer Affairs is in charge of public distribution systems such as ration cards, allocation generation status, supply chain, and FPS automation, among other things. Users of smart cities can access the forms online and apply for various services.

1.1.2. EV Charging

There are 4 EV car charging stations in Dehradun. Tata charging stations is one of the electric charging networks.

9.9 RECREATIONAL AREAS AND GREEN SPACES

9.9.1 Hierarchy of Open Spaces

The open spaces can include the following three categories, namely:

- Recreational space
- Organised green.
- Other common open spaces (such as vacant lands/ open spaces including flood plains, forest cover etc. in plain areas.

9.9.2 Parks and Gardens

There are many parks and gardens in the city for tourists and city residents to enjoy, such as Gandhipur Garden on Rajpur Road, Mata Wala Bagh on Saharanpur Road, which is a popular picnic and community gathering spot for city residents, and another popular park is MDDA Park on Rajpur Road, which is also included in smart city proposals to make the garden more effective and higher tech.

9.9.3 Playgrounds and Sports Facility

The city is considered an educational hub, there are more students in the city who participate in a variety of sports. As a result, the city has numerous sports facilities and practise grounds, such as the Rajiv Gandhi International Stadium, which is owned by the government and is located in Raipur. This stadium is well-known for hosting cricket matches. Doon Cricket Academy is in Kuawala, while Abhimanyu Cricket Academy is in Bist Gaon.

9.9.4 Multi-purpose Grounds

Parade Ground is a multipurpose playground that is used for a variety of activities such as holding a fair, exhibition, sports, and a parade on Republic and Independence Day.

9.9.5 Gap Analysis

There is one requirement of multipurpose ground as per the standard to cater the planning are population and by 2041 there is requirement of 2 more.

1.1.3. Demand Projections

Need Administrative assistance to get the information of total existing recreational facilities.

9.10 POST OFFICE (DISTRIBUTION AND COVERAGE)

Dehradun City Post Office is located at *Dehradun City, Dehradun* of Uttarakhand state. It is a sub office (S.O.). A Post Office (PO) / Dak Ghar is a facility in charge of sorting, processing, and delivering mail to recipients. POs are usually regulated and funded by the Government of India (GOI).

Dehradun City dak ghar offers all the postal services like delivery of mails & parcels, money transfer, banking, insurance and retail services. It also provides other services including passport applications, P.O. Box distribution, and other delivery services in Dehradun City.

There are basically classified into 3 types, namely – Head Post Office, Sub-Post Office including E.D. Sub-Office and Branch Post office. Dehradun City P.O. is a Sub Post Office. So far as the public is concerned, there is basically no difference in the character of the service rendered by Sub-Post Offices and Head-Post Offices except in regard to a few Post Office Savings Bank (SB) transactions. Certain Sub Post Offices do not undertake all types of postal business. Facilities are generally provided at Branch Post Offices for the main items of postal work like delivery and dispatch of mails, booking of registered articles and parcels accepting SB deposits and effecting SB withdrawals, and issue and payment of money orders, though in a restricted manner.

9.11 ISSUES AND POTENTIAL(S)

- Social infrastructure sector is strong for existing population in many sectors including health, education, religious etc.
- Strong health and education sectors have potential to promote medical and educational tourism.
- Dehradun lacks in providing the required community halls. The existing facilities is far more less than what is required
- Fire stations are not sufficient to cover the whole city.
- There are black spots in the city which leading to more crime and accidents.

10 TRANSPORTATION

10.1 INTRODUCTION:

Dehradun city is well connected to regional urban centres in terms of transportation. Dehradun is the capital city which is well connected to other urban centres of the state and adjoining areas.

The study of transportation is essential for understanding the pattern of development because connectivity helps the city to become vibrant economic centre, and traffic and transportation are one of the primary reasons for the city's expansion. This section of the report will discuss the city's current traffic and transportation characteristics. Special focus on problems encountered by city residents and tourists while travelling into the city; which are discussed in detail with facts as well as strategies to mitigate the impact of traffic transportation issues in the various sections of this chapter.

Traffic congestion is a major and important issue in the Dehradun urban agglomeration. Traffic congestion occurs when travel demand exceeds the existing road system capacity. Congestion is a condition that arises because more people wish to travel at a given time than the transportation system can accommodate: a simple case of demand exceeding supply. Thus, transport plays an important role for probably in urban areas, particularly about while trips and trips generation to central areas. The study is important to identify, in detail, the problematic situations related to the existing transportation infrastructure and traffic operation.

The analysis from these studies could further help us provide details on the development and validation of the travel demand model for the study area, helps in projecting travel demand in the study area for different horizon years and helps develop and evaluate various transport strategies. Not only that, it could further guide the responsible authorities to propose solutions that can increase the efficiency and life of roads, reduces traffic volume at a particular section, provide better means for the development of infrastructures, and provide better means to utilise other roads in case of special events in the city and provide an estimate of no vehicles against no of persons.

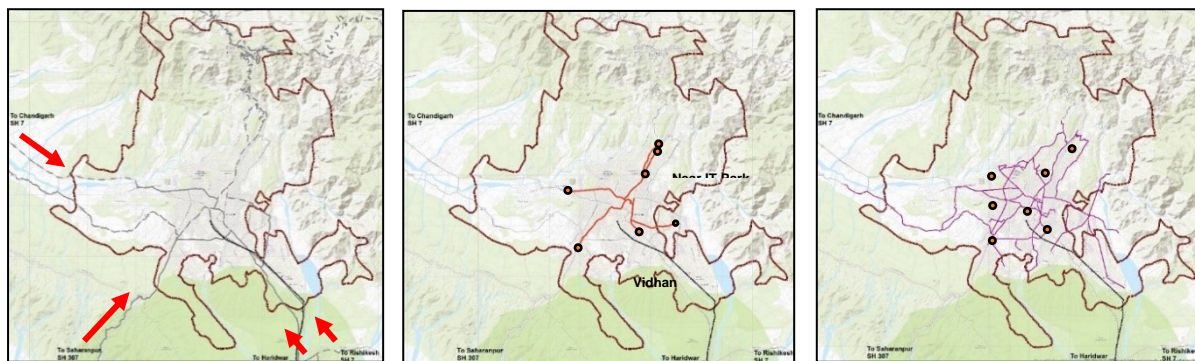
10.2 ROAD NETWORK CHARACTERISTIC(S)

Dehradun is well connected by rail and road. NH-72 passes through the city connecting Rishikesh and Haridwar in the east to Himachal Pradesh in the western side. NH-72A connect the city with Saharanpur in the S-W and Roorkee in the south. A large number of attractions of traffic in the CBD area due to the presence of offices, commercial establishments. The autorickshaws stop wherever passengers board/alight, thereby causing congestion and delay to other vehicles. It has been observed that areas like clock tower, railway station, Patlan bazaar; Connaught place are having heavy pedestrian flows.

The road system is radial originating from the City Core area of Paltan Bazaar with Rajpur Road, Haridwar Road, Saharanpur Road and Chakrata Road forming themajor travel corridors. The traffic carrying capacities are low due to limited widths, intense land use. and encroachments. A new bypass has been constructed connecting Saharanpur Road near Transport Nagar with Haridwar Road. Other important roads in the city are Kaulagarh Road, Raipur Road, Shahastradhara Road, Kaonli Road, New Cantonment Road, Subash Road and East Canal Road. The nearest Airport is at Jolly Grant, which is about 24 km from the city.

There are three transit corridors in Dehradun Planning area as shown in the maps below:

Map 10-1: Three transit corridor in Dehradun Planning Area



The MDDA Planning Area has three entry points: one in the south-west direction from Saharanpur, one in the north-west direction from Chandigarh, and one in the south-west direction from Haridwar Rishikesh. Aside from that, there are first and second order corridors, with the first consisting of a stretch from Mussoorie to ISBT and the second from Raipur to Vidhan Sabha; the same stretch is proposed under the NEO-Metro project, and the second consisting of all internal roads.

10.2.1 Classifications of Road

Dehradun City has a road network of 463 kilometres. Municipal Corporation maintains 363 kilometres, while PWD maintains 130 kilometres. Aside from NH-7, major highways that pass through the Dehradun Planning Area include SH-55, MDR 9, MDR 10, MDR 11, ODR 12, ODR 13, ODR 14, and ODR 37.

Table 10-1: Road Hierarchy in Dehradun Planning Area

Sr. no	Classification based on ROW	Road Length	%
1	Arterial road (50m-80m)	12.62	2.73
2	Sub-arterial road (30m-50m)	36.33	7.85
3	Collector road (12m-30m)	214.51	46.34
4	Local road (below 12m)	199.49	43.09
Total		462.95	100

Source: Primary Survey

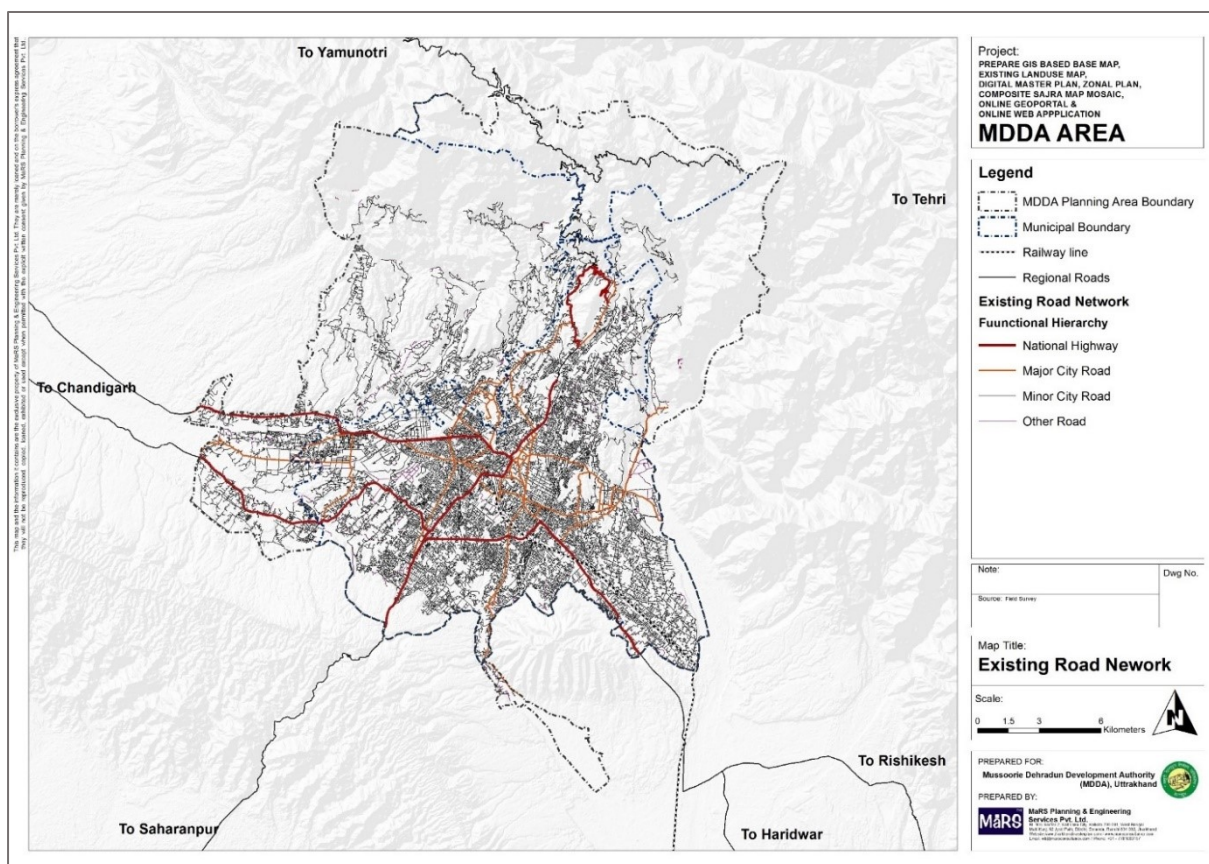
Out of the Road Network, more than 65% of roads have ROW less than 18m. Lack of availability of higher-order roads within the city leads to traffic congestion, lack of proper NMT Infrastructure, provisions for on-street parking facilities, and so more. The road hierarchy of the Dehradun Planning area is discussed in the table, and figure are given below:

Table 10-2: Road Hierarchy in Dehradun Planning Area

S. No	Classification Based on ROW	Existing ROW	Min. ROW as per IRC codes (for hilly area)
1.	National and State Highways (Double Lane)	24 -30m	20 m-24 m /
2.	Major District Roads	12- 18 m	15m- 18 m
3.	Other District Roads	5m – 6m	12m -15 m
4.	Village Roads	0 m-6 m	9 m

The above table compares Dehradun's existing ROW with IRC codes. The data proves that the ROWs of other district roads and village roads are not up to the IRC standards and need road widening, according to the standard for existing and future population.

Map 10-2 :Road Hierarchy in Dehradun Planning Area



Source: Primary Survey

10.3 MOVEMENT OF PASSENGERS AND GOODS

As stated in the preceding section, the city is linked by airway, railway, and all-weather road for passenger movement within the country, interstate, and intercity. Passengers travel by road within the city on motorized and non-motorized vehicles such as two-wheelers, four-wheelers, public buses, Vikrams, and Autos.

There are two truck terminals at Harrawala and at Doiwala on the outskirts of the city where goods are loaded and unloaded; these goods are typically from regional scale cities such as Shimla, Delhi, Chandigarh, and Agra. There are Chota hathi who deliver goods to the city's commercial areas for intra-city goods movement.

10.4 TRAFFIC CHARACTERISTICS AND TRAVEL BEHAVIOUR

The demand for transport infrastructure increases with the urbanisation of cities. People begin to travel longer distances for various purposes. The need for faster and safe modes increases. Inadequacy in public transport in terms of quantity and quality leads to shifting to private vehicles. The city witnessed a 20% increase in vehicle registration from 2016 to 2017, with an additional 10700 vehicles on the road in one year. The vehicle composition and vehicles registered over the years in Dehradun are shown in the pie chart below. It can be seen that private vehicles, two-wheelers and four-wheelers have the highest share in the vehicle composition at almost 95%.

10.4.1 Vehicular Growth in Dehradun

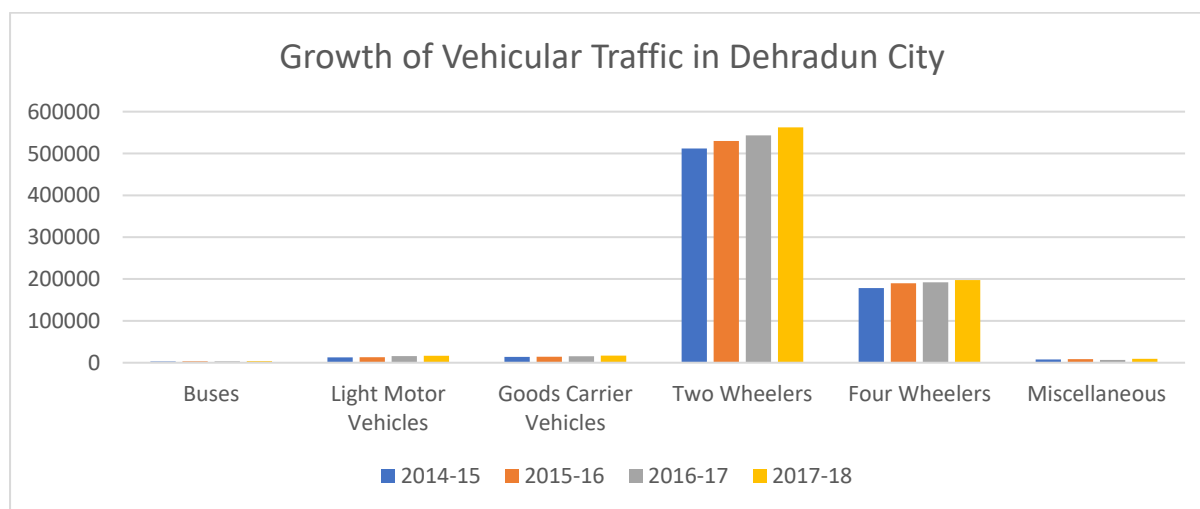
The growth of motor vehicle in Dehradun is 727993 in year 2014-15 which increase by 30782 in year 2015 -16 with the total increase of 758775, with the passage of time as population increase in 2017-18 the registration has come up 806137 vehicles in year 2017-18

Table 10-3 :Growth of vehicular traffic in Dehradun

Sr. no	Classification of vehicles	2014-15	2015-16	2016-17	2017-18
1	Buses	2971	3039	3197	3455
2	Light Motor Vehicles	12730	13128	15689	16484
3	Goods Carrier Vehicles	13871	14362	15345	16888
4	Two Wheelers	511972	530024	543525	562542
5	Four Wheelers	178563	189672	192107	197392
6	Miscellaneous	7886	8550	6676	9376
Total		727993	758775	776539	806137

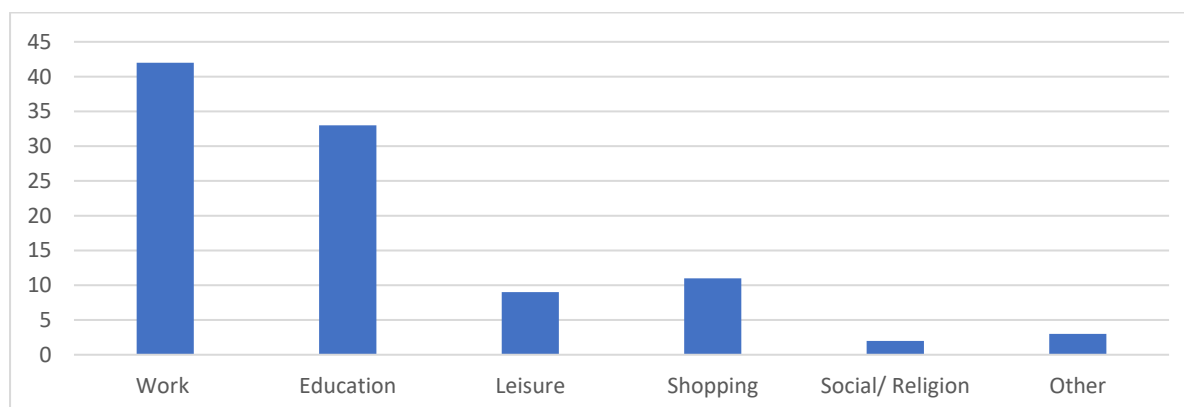
Source: Smart City Dehradun

Graph 10-1: Growth of vehicular traffic in Dehradun



Source: Primary survey

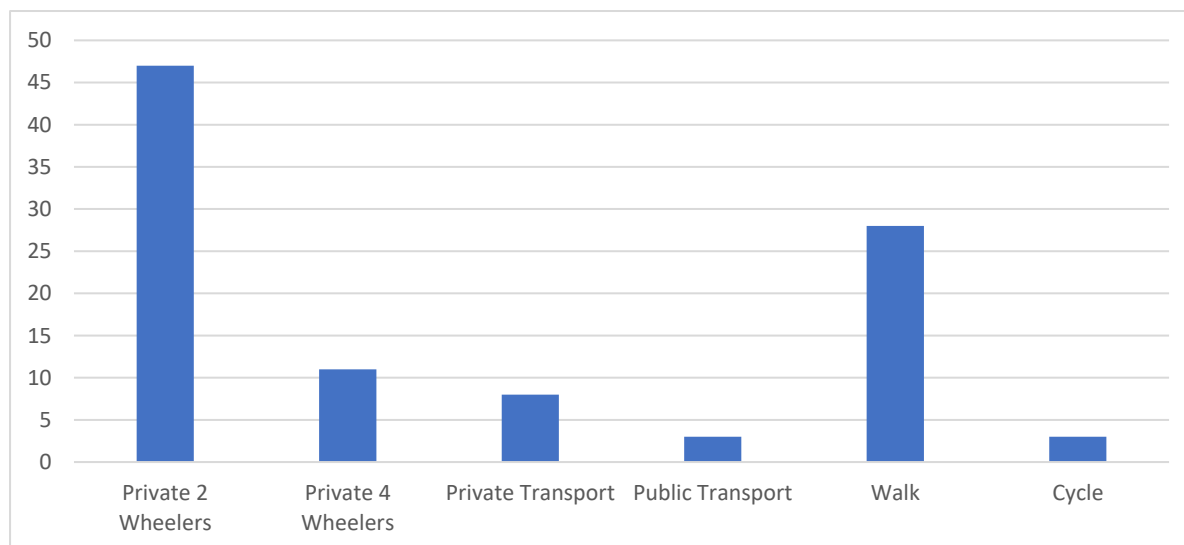
Graph 10-2: Purpose of the Trip



Source: Primary Survey

The main purpose of trip is work, more than 85% Households used their own vehicles for travelling, Use of public transport is very less, and the use of non-motorized transport is around 6%.

Graph 10-3: Travel mode for trip



Source: Primary survey

According to the findings of the household survey, the majority of HHs use private vehicles, such as two-wheelers and four-wheelers, for daily transportation to work and school. Two-wheelers are the most popular mode of transportation for work or school in Dehradun. The main reason for the mode is that people travel to work/education during peak traffic hours. As a result, two-wheelers are the preferred mode of transportation to avoid delays and traffic. Students and the non-working population use NMT extensively, particularly walking. Only 3% of public transportation is owned by the government.

10.4.2 Speed Delay Survey

Based on the speed and delay survey analysis, the average speed of private vehicles in the urban areas of Dehradun city is about 19.73 Km/hr. and in off-peak, it is 23.44 km/hr.

Table 10-4: Speed Delay survey

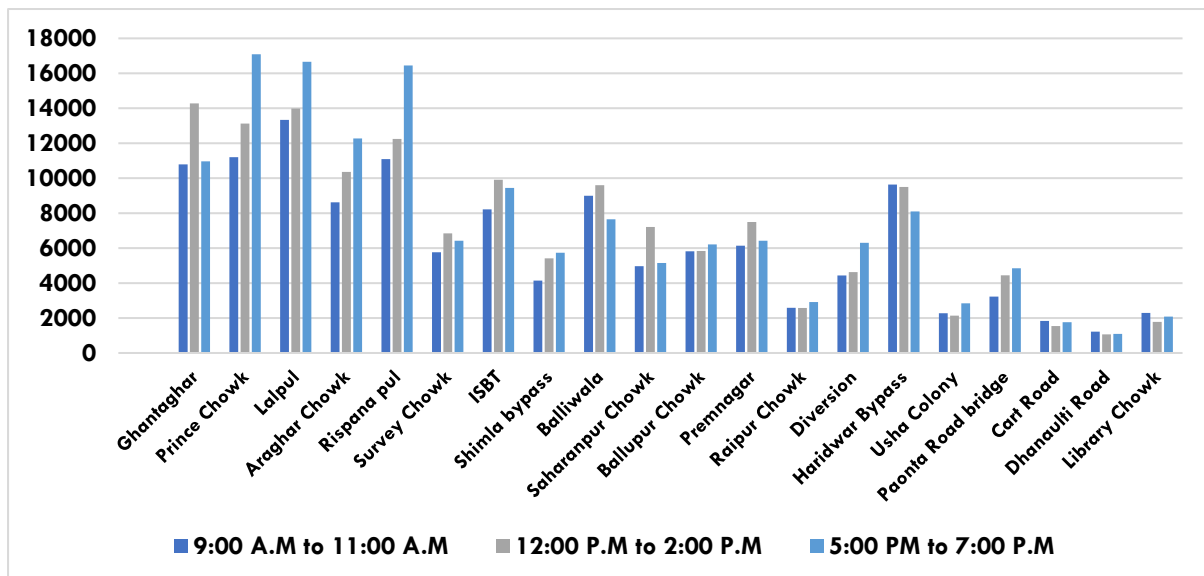
Location	Peak Hour Km/hr	Off Peak Hour Km/hr
Dehradun	19.73	23.44

Source: Primary survey

10.4.3 Traffic Volume Survey

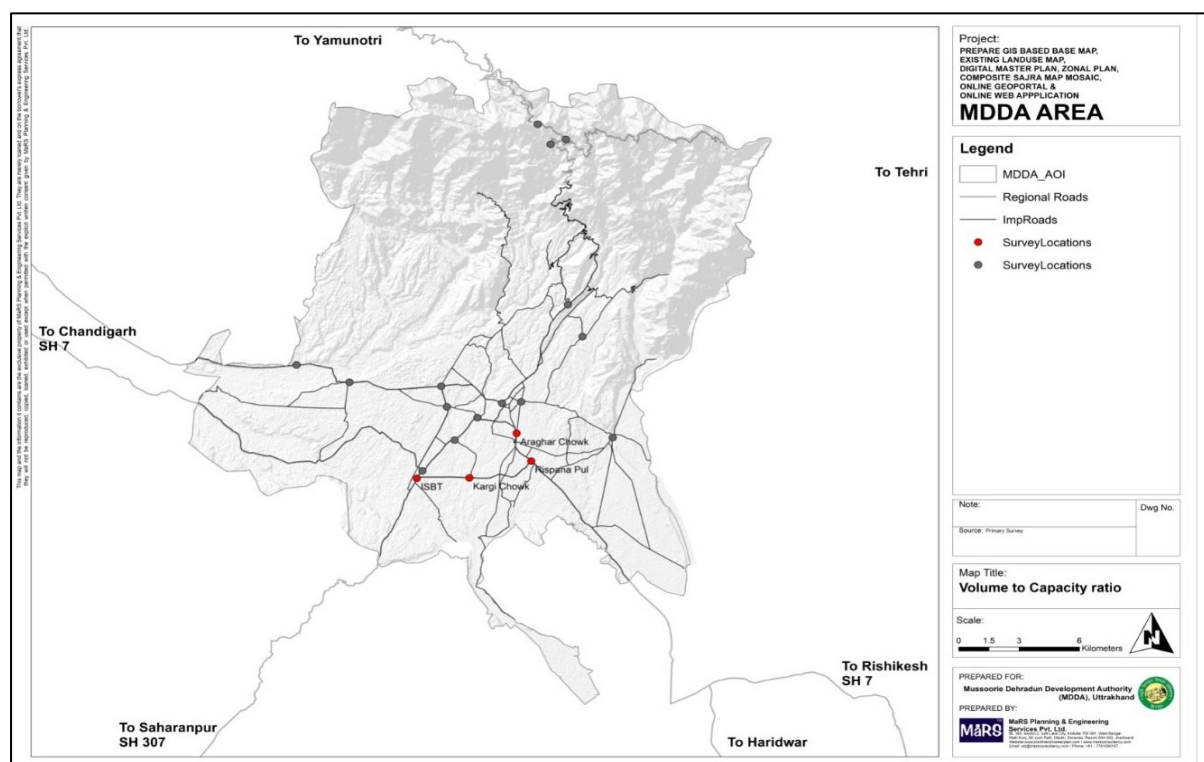
Traffic volume count were conducted at all major intersections mentioned into the table and figure given below. As a part of our analysis, PCU for the selected intersection has been calculated which is the product of peak hour traffic flow. At last, Volume/ Capacity Ratio is calculated at each selected junction and compared with the design standards. As per V/C Analysis, Kargi Chowk, Aragarh Chowk, and ISBT are the critical junction.

Graph 10-4: PCU in peak hour



Source: Primary survey

Map 10-3 TVC Survey location



Source: Primary Survey

Locations on VC range between 1.5-2 have the highest TVC in Dehradun city. The highest TVC represents that these locations have the highest traffic and congestion issues and needs infrastructural improvements.

Table 10-5: V/C Ratio

Location	PCU	Type of carriageway	Hierarchy	Design Service Volume (PCU/ hr)	V/C (Max)
Ghantaghar	14282	4-Lane Divided (Two - Way)	Arterial	3600	1.98
Prince Chowk	17090	4-Lane Divided (Two - Way)	Sub - Arterial	2900	2.95
Lalpul	16664	4-Lane Divided (Two - Way)	Sub - Arterial	2900	2.87
Araghar Chowk	12272	4-Lane Divided (Two - Way)	Sub - Arterial	2900	2.12
Rispana pul	16453	4-Lane Divided (Two - Way)	Sub - Arterial	2900	2.84
Survey Chowk	6845	2-Lane (Two - Way)	Sub - Arterial	1200	2.85
ISBT	9916	4-Lane Divided (Two - Way)	Arterial	3600	1.38
Shimla bypass	5739	2-Lane (Two - Way)	Sub - Arterial	1200	2.39
Balliwala	9603	2-Lane (Two - Way)	Sub - Arterial	1200	4.00
Saharanpur Chowk	7208	4-Lane Divided (Two - Way)	Sub - Arterial	2900	1.24
Ballupur Chowk	6211	4-Lane Divided (Two - Way)	Sub - Arterial	2900	1.07
Premnagar	7496	4-Lane Un-Divided	Sub - Arterial	2400	1.56
Raipur Chowk	2917	4-Lane Un-Divided	Sub - Arterial	2400	0.61
Diversion	6305	4-Lane Divided (Two - Way)	Sub - Arterial	2900	1.09
Haridwar Bypass	9639	2-Lane (Two - Way)	Arterial	1500	3.21
Usha Colony	2839	4-Lane Un-Divided	Sub - Arterial	2400	0.59
Paonta Road bridge	4845	4-Lane Un-Divided	Sub - Arterial	2400	1.01
Cart Road	1836	2-Lane (Two - Way)	Sub - Arterial	1200	0.77
Dhanaulti Road	1222	2-Lane (Two - Way) (5.50m)	Collector	900	0.68
Library Chowk	2296	2-Lane (Two - Way)	Sub - Arterial	1200	0.96

Source: Primary survey

Maximum traffic congestion is observed in the Centre and Southern Parts of Dehradun. There is an immense requirement for bye-pass to reduce traffic from the core city area. As well, a major road is required to divert the tourist population for the Mussoorie without entering the city.

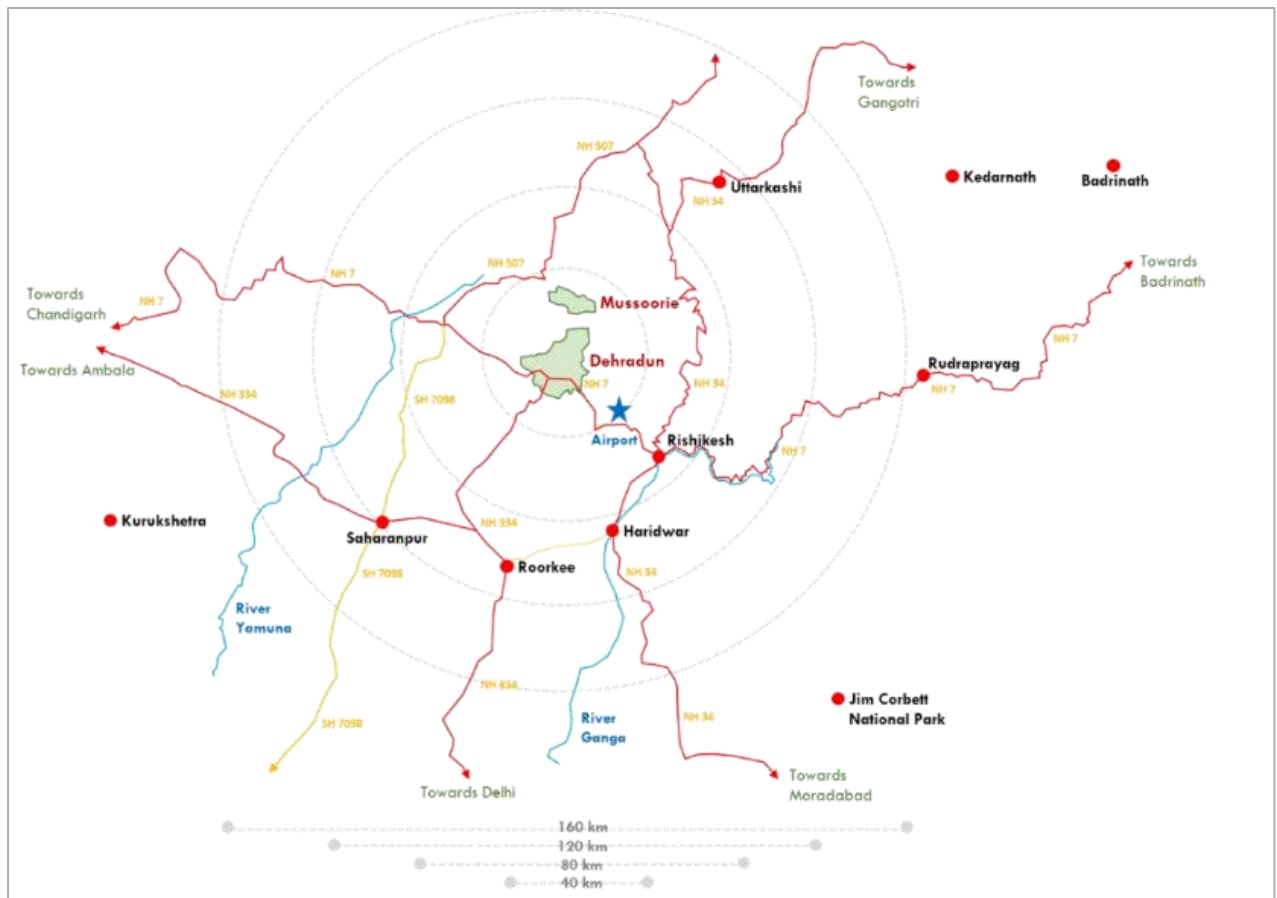
10.5 TRAVEL MODE

Over the period, the area's transportation modes and its orientation have been shaped predominantly by the highway and automobiles. This section describes the different modes of transport prevailing in the study area.

10.5.1 Roads

Dehradun City is well connected with the nearby Urban Centres through National Highways and State Highways. Through NH 7, the city is directly connected to Rishikesh (45 km) and Haridwar City (50 km) in the South East Direction and further, it connects to Rudraprayag (176 km) and Badrinath (329 km) in the East direction. The Same Highway Connects to Chandigarh (169 km) in the west direction. NH 334 connects Roorkee (70km), Saharanpur (68 km) and Delhi (334 km) in the south direction and Ambala (180km) in the west direction.

Map 10-4 : Regional Connectivity through road



10.5.2 Railways

Dehradun city falls under the Northern Railway Zone. Firozpur, Ambala and Moradabad are the Zonal Head Quarters. Dehradun is connected by a portion of the Lashkar-Haridwar-Dehradun section of the Moradabad division of the Northern Railway. Lashkar – Haridwar – Dehradun section is a broad gauge with a single non-electrified line. There are five stations between Haridwar and Dehradun, and those are: Motichur, Raiwala, Kansrao, Doiwala, Harrawala

10.5.3 Terminals and Capacity:

Dehradun is also the freight terminal of the region. However, Dehradun cannot handle 14-coach or longer trains, whereas Indian Railways run trains with 24 coaches. This constraint is on account of the terminal facility shortage at Dehradun. But Dehradun can handle more passenger trains of 12 – 14 coaches easily. As there is substantial traffic to/from Haridwar, coaches are being detached and attached on most of the trains at Haridwar. Around 10-12 trains run on this route. Hence, we can say there is good railway connectivity for the town.

Line capacity on all three segments is saturated, and there is no capacity to run additional trains. However, the state government proposes to double the railway line between the Lashkar-Dehradun sections. Moreover, the state government has proposed to build a satellite railway station at Harrawala Junction. But Rail demand must be considered before assessing the infrastructure requirements at the Junctions falling under the Planning Area.

10.5.4 Airways

Jolly Grant is the largest commercial airport in Uttarakhand, and this airport is around 30km from Dehradun. This airport is centrally located between Dehradun, Haridwar and Rishikesh Cities. Daily several flights operate from here by various air lines players such as: IndiGo, Spice Jet, Air India, and Jet Airways towards Delhi, Mumbai, Ahmedabad, Hyderabad, Kolkata, Bengaluru etc.

Proximity to various tourist places enables tourists to fly into Uttarakhand instead of travelling by rail or road.

10.6 INTERSECTIONS AND CROSSING

There are 35 major intersections within the Dehradun. The following table shows the names and types of the junctions.

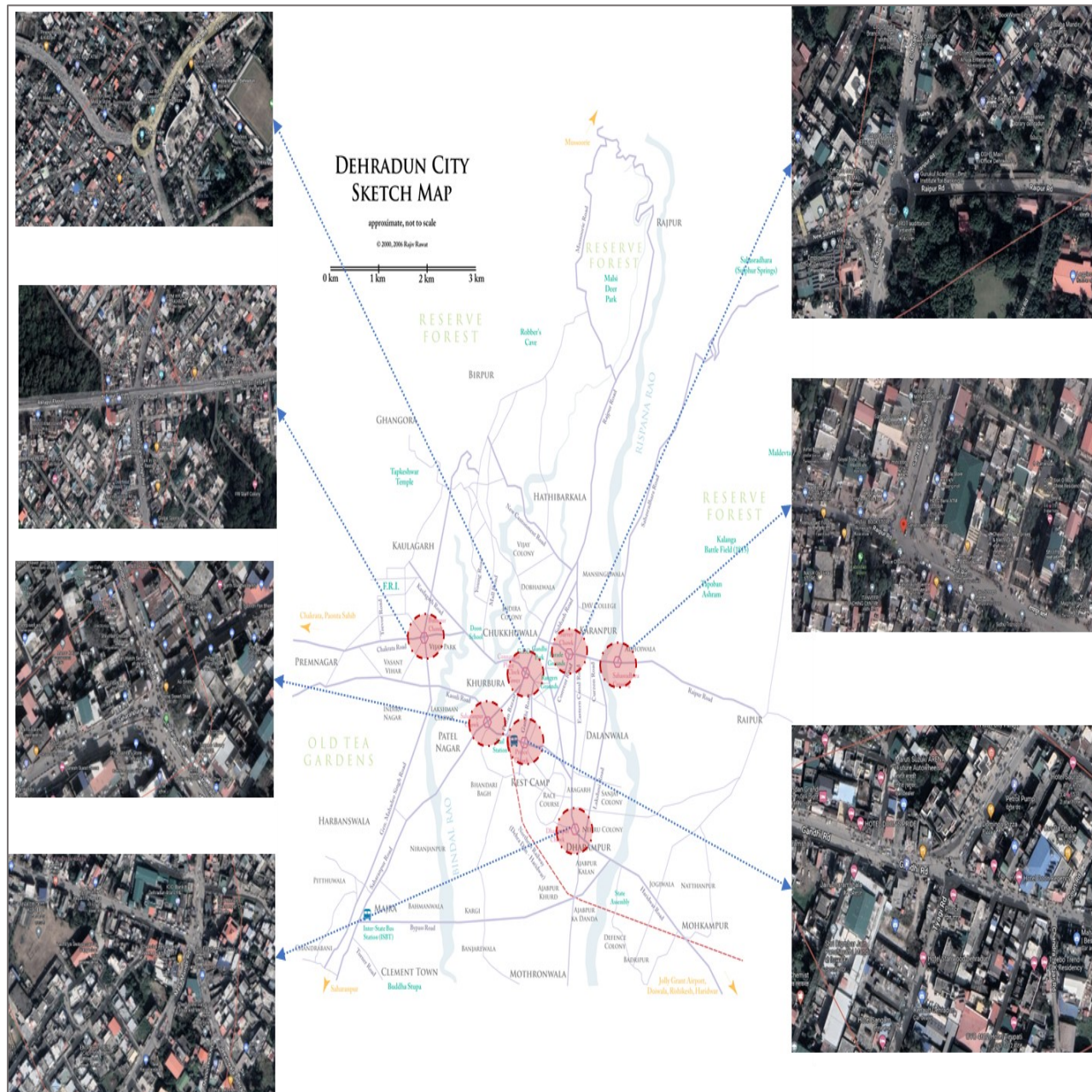
Table 10-6: List of intersections in Dehradun Planning area

Name of intersection	Type	Footpaths	Issues
Bullapur chowk	Deformed intersection	Present	On-street parking of two-wheelers
Canought place Clock tower	Roundabout intersection	Present	
Prince chowk	Deformed intersection	Present	The median is missing, parking encroachments by two-wheelers, shops encroachments.
Saharanpur Chowk	Y intersection	Present	Vehicular encroachments
Sahastradhara Crossing	T intersection	Present	The median is missing
Dharampur Chowk	Deformed intersection	Present	The median is missing
Survey Chowk	Circular intersection	Present	

Source: Primary survey

Intersections like- prince chowk, Ballapur chowk, and Saharanpur chowks are on commercial land uses. Due to the lack of parking spaces, there is the encroachment of vehicles, especially two-wheelers. Also, commercial shops are encroaching on footpaths which causes vehicular pedestrian conflicts at the junctions. Moreover, a few intersections like Dharampur chowk, Sahastradhara crossing, and Prince chowk does not have dividers which increases the chances of accidents and injuries to the public.

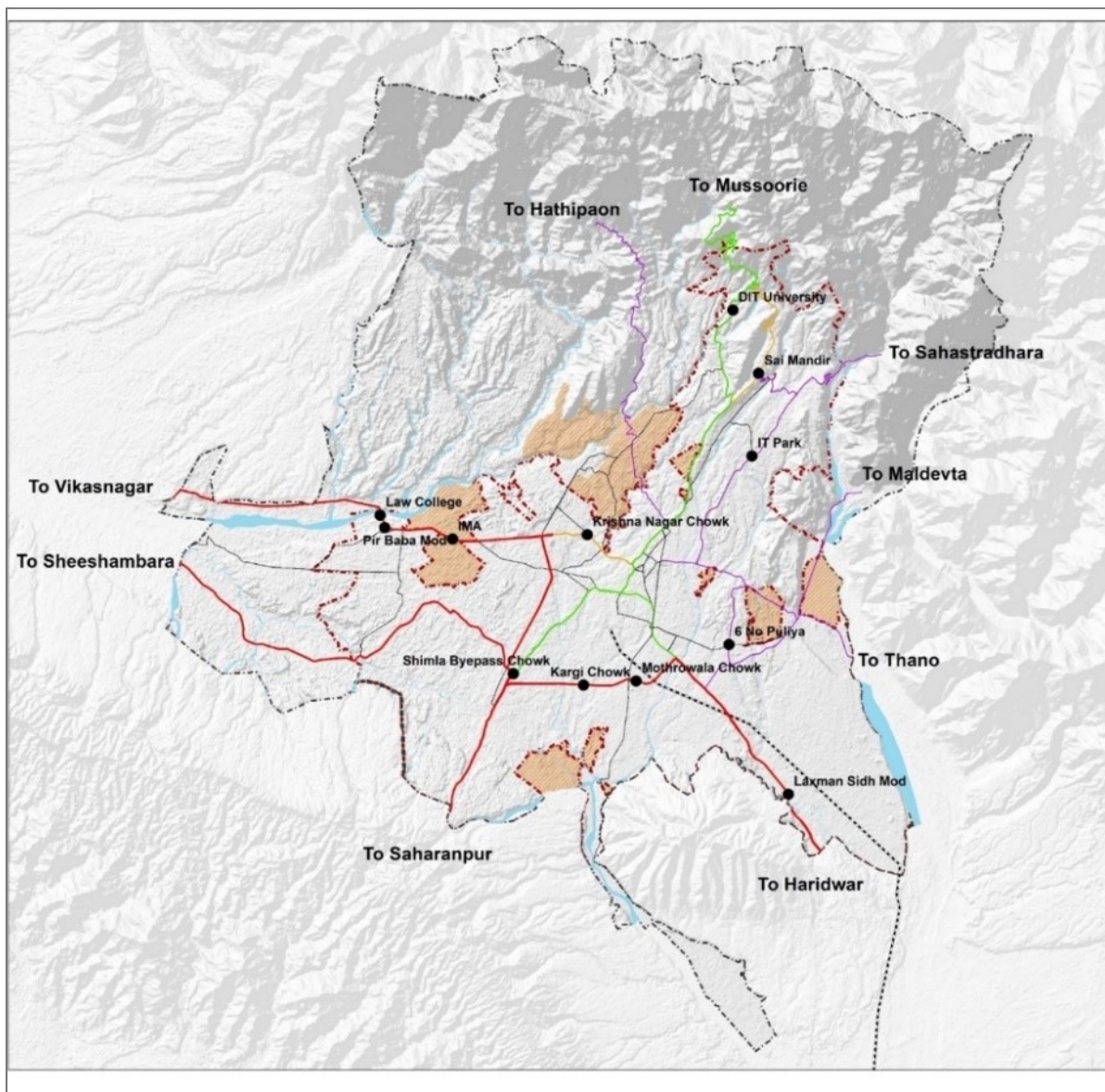
Figure 10-1: Location of Inter sections in Dehradun planning area



10.7 TRAFFIC BLACK SPOT

Black spots which witness maximum accidents and are high-risk zones for accidents because of the engineering default of the place are shown in the map below for Dehradun. As per CMP Report – 2019, some of the identified locations by the traffic police department are shown on the map given below.

Map 10-5 : Location of Black spot in Dehradun Planning Area



10.7.1 Road Accidents Data

Along with traffic congestion, many accidents also happen in the city. Based on the information collected from the traffic police, the number of accidents and blackspots identified are discussed below:

Table 10-7: Accidents in Dehradun

Year	No of accidents	No of deaths	No of injured
2013	296	138	274

Year	No of accidents	No of deaths	No of injured
2014	314	146	285
2015	343	143	303
2016	295	139	220
2017	342	132	143
Until 2018 March	75	26	53

Source: CMP Report Dehradun

The above data proves that the accident rates are improving every year due to an increase in congestion, traffic, pedestrian and vehicular conflicts, lack of infrastructure etc

10.8 PUBLIC TRANSPORTATION SYSTEM

Public transport is one of the most environmentally sustainable forms of transport. Public Transport in Dehradun is provided by minibuses of 220-seat capacity by private operators. The routes and licenses for operating the buses is given by the Regional Transport Office (RTO) Department, Government of Uttarakhand. Large Auto Rickshaws (locally referred to as Vikram) with a seating capacity of 7 persons operate on fixed routes within Dehradun. 2460 Vikrams and auto rickshaws operate in Dehradun. Additionally, regular auto rickshaws also ply in the city carrying passengers from main junctions and roadside to their desired destination.

10.8.1 Inter-City Public Transport

Inter-city traffic is served by a new Inter State Bus Terminal (ISBT) - commissioned in June 2004. The route and fare structure is fixed by Road Transport Authority. Inter State Bus Terminal of Dehradun is located at the Delhi Dehradun highway and Haridwar By Pass Road. There is a regular bus service from Dehradun to Haridwar, New Delhi, Roorkee, Rishikesh, Jaipur etc.

10.8.2 Intra-City Public Transport

The existing intracity public transport system is being operated by private operators through. The private buses are operating on ten routes having a fleet of about 100 buses. The buses take care of about 1 lakh trips.

10.8.2.1 Bus Service

There are 10 major intra-city bus routes defined in the table below; the frequency of buses varies depending on the route; most buses run between 15 and 30 minutes. Mini buses line the parade ground, and the remaining buses depart from ISBT Dehradun.

Table 10-8: Details of bus routes in Dehradun Planning Area

Route No.	Route Structure	Operational Bus fleet
1	Rajpur Road — Clement Town	24
	via Clement Town, Majra, Saharanpur Chk, Gandhi Road, Parade,	
	Subash Road, Dillaram Balar, (Shahanshai Ashram)	
	Extended Routes:	

Route No.	Route Structure	Operational Bus fleet
	Char Khamba	
	Subash Nagar	
	Bharu Wala	
2	D. L. Road — Defence Colony	12
	Via Police Chauki, Dillaram Bazar, Clock Tower	
	Prince Chk, Haridwar Road, Defence Colony	
	Extended routes:	
	Defence Colony — Nabada	
	Nabada — Majri	
	Defence Colony — Kedar Puram	
	Shiv Nagar — Gaurakhpur	
	Rispana Rao — Jogiwala	
3	ISBT Parade — Sahastradhara	14
	via Parade Ground	
4	Prem Nagar - Gular Ghati	18
	via Bhaliwala Chk., Prince Chk,	
	Jogiwala, Harawala, Bailer Wala, Gular Ghati.	
	Extended routes	
	Premnagar — Panda — Bhawal	
5	Banjara Wala — Gular Ghati	9
	Via Kargi, Guro Ram Rai Degree College, Shahrn Pur Chk,	
	Prince Chk, Darshan Lal Chowk, Parade, Survey Chk.,	
	Sahartradhara Jn., Raipur, Ranjha Wala, Nathu Wala, Balwali,	
	Gular Ghati,	

Route No.	Route Structure	Operational Bus fleet
	Extended routes	
	Tapovan to Nala Pani	
	Raipur to Ordinance Factory	
	Banjara Wala to Muthra Wala	
	Prince Chowk to Nehru Gram	
	Nehru Gram to Upper Nehru Gram	
6	Parade Ground — Parwal	8
	via Darshan Lal Chk, Cannaught Place, Prem Nagar Parwal	
7	Purkal Gaon — Mathura Wala	9
	via Chand Roti , Anarwala (Surdly Depot); Hathu Badkala, Dilram Bazar, Globe Chk, Pavillion, Subash Depot, harampur, Azabpur, Mathura wala	
8	Thana Cant — Ballupur	1
	via, GMS Road, Sabzi Mandi, Majra, By Pass — Rispana Rao Subash Road — Pande	
9	Nabada Majra - Rispanapur	1
	via, Subhash Marg, Parade ground, Majra, By Pass — Rispanapur	
10	Prem Nagar — Dhonlas Ki Chakki	1
	via Nanda Chk, Phulsoni, Amwala.	
	Total	97

10.8.3 Taxi Services

There are four major taxis stands in Dehradun, two of which are approved. The first taxi stand, approved by the authority, is located in the railway station on Arhat Bazar Road. The taxi stand is located on the grounds of the railway station. There are about 50-60 taxis parked there, and each taxi has its own route. The Indira Market taxi stand, located near the clock tower, is the second taxi stand. It is a local hangout for shopping and socialising. The taxi stand has been approved and covers approximately 4000 square metres. Taxi stands offer transportation to market visitors and tourists. The third taxi stand is the Rispana pull taxi stand, which is located near the Rispana river. The stand is located in an open field beneath the flyover. Although the stand is not causing any traffic congestion, it is still illegally standing near the river. The ISBT Taxi stand, which is also approved, is the fourth taxi stand. There are approximately 150-200 taxis present. Despite the fact

that the stand is approved, many taxis and tempos stand outside the ISBT stand to get passengers first, causing traffic problems in the surrounding area.

10.8.4 Autos and Vikram's

Vikram is the main public transport mode in the city and operates from the roadside, utilising the road right of way as terminals and causing delays to other vehicles plying on the road. About ten main tempo routes are operating in the city, with as many as 1300 tempos on the road. These take care of about 1.6 lakh trips.

Table 10-9: Tempo Route structure

Route No.	Route Structure	Operational tempo fleet
1	Ashley Hall — Rajpur Via Globe Chowk, Dilaram Bazar, Jakhan	59
2	Ashley — Garhi Cantonment	19
	Globe Chowk, Dilaram Bazar, Hathi Wadkala	
3	Connaught Place — Garhi Cantonment	12
	Via Bindal Bridge, Doon School, Cantt. Road	
4	Connaught Place - Kaulagarh	50
	Via Bindal Bridge, Kishan Nagar Chowk	
5	Connaught Place - Premnagar	68
	Via Bindal Bridge, Kishannagar, Ballupur Chowk, Panditwari	
6	Parade Ground — Parwal	
	via Darshan Lal Chk, Cannought Place, Prem Nagar Parwal	
7	Parade Ground — Premnagar Via Darshan Lal Chowk, Prince Chowk, Kaonli Road	22
8	Parade Ground — Majra via Prince Chowk, Saharanpur Chowk, Patel Nagar, Majra, Subhash 240 Nagar, Clement Town, Mahuvewala	240
9	Dharampur — Mothurawala Via Bypass	140
10	Parade Ground — Raipur.	67
	Total	767

10.8.5 App Based Cab Services

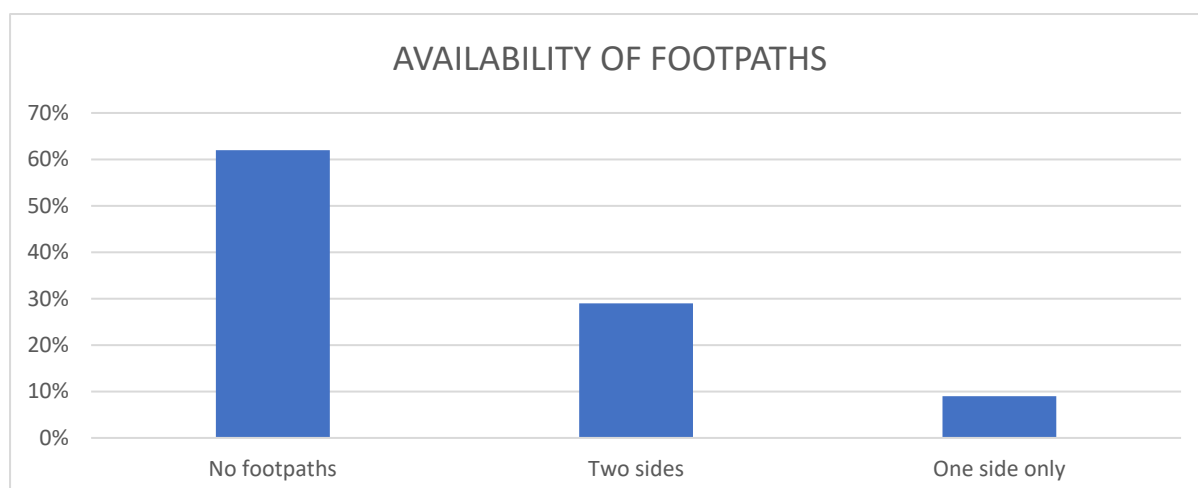
Dehradun city is accessible to cab services through apps like ola and uber. The app can be installed on phones and the public can check the fare online. Rapido is another app-based bike sharing and riding service which is very popular among students.

10.9 PEDESTRIAN MOVEMENT

Pedestrian trips are generally short and can be observed everywhere in a city. Hence, ideally pedestrian walkways should be provided on all major roads and streets in the city. Proper pedestrian facilities are essential to encouraging and promoting this sense of community and liveability. Also, special consideration for pedestrians should be given near junctions (dangerous intersections), and major activity nodes (like schools, colleges etc.) The smaller local streets/residential streets may not have sufficient width to provide a segregated pedestrian walkway.

But in case of Dehradun, hindrance is found to pedestrian movement because of the absence of foot paths or encroachments done by shop owners or informal activities. It is estimated that a total of 84.9 km of road network in the Dehradun require dedicated pedestrian footpaths. Footpath and cycle tracks are the basic non-motorized transport infrastructure. Their existing conditions, loopholes, future requirement is described into the sub – sections given below:

Graph 10-5: Availability of Footpath



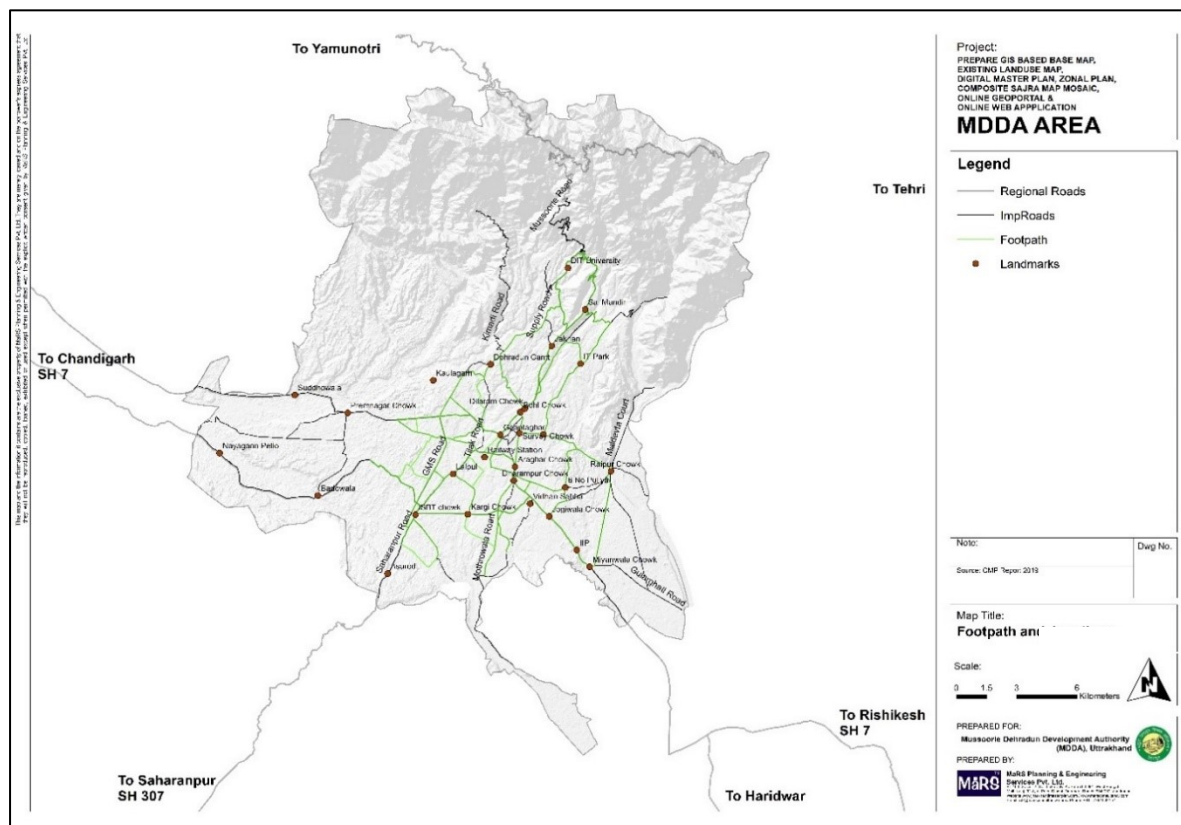
Source: CMP Report- 2019

As per Comprehensive Mobility Plan – 2019 of Dehradun City, NMT infrastructure of city of Dehradun needs significant improvement. Only 29% of the surveyed roads has footpath on both sides and 9% has on one side. While 62% of the surveyed roads lack footpath.

According to the current scenario and town study from Tehsil Chowk to Prince Chowk, the entire sidewalk on Gandhi Road has been encroached upon by roadside vendors. Even shop owners use the space to display their wares. Mechanics can be seen working on the sidewalk all day. Vehicles parked in no-parking zones exacerbate the problem. There is also a need to improve basic infrastructure, such as making access easier for people with special needs, improving street lighting, wider and cleaner level footpaths, reducing and slowing traffic on streets, and removing obstacles from footpaths. Not only that, but most of the footpaths are broken, and to avoid traffic, bikers sometimes use the footpaths. Notably, in a walkability study titled "How walkable is Dehradun?" conducted by the city-based think tank Gati Foundation last year, approximately 60% of Dehradun residents rated the pedestrian infrastructure as poor or very poor.

At places where there are footpaths the traffic signals do not accommodate a pedestrian phase which further increases the wait time of pedestrians at traffic signals. The city needs improvements in terms of pedestrian infrastructure which need to be safe, comfortable and sustainable.

Map 10-6: Availability of Footpath in Dehradun Planning Area



Source: CMP Report- 2019

Figure 10-2: Condition of Footpath in Dehradun Planning Area



10.10 NON-MOTORISED TRANSPORT

According to the CMP, The NMT infrastructure in the city of Dehradun needs significant improvement. The service level benchmark of NMT of Dehradun should be LOS- 12, but the existing LOS is 4 hence, there is lack of adequate non-motorized facilities. (As per CMP).



10.11 CYCLE TRACKS

The city has no existing cycle tracks. The lack of cycle tracks endangers the public's life and forces them to travel in motorised vehicles, which harms the environment and their health. A cycling track in Paltan bazaar has been proposed by the smart city project.

10.12 ROB/FLYOVERS

There are seven flyovers in the city located in miawla Chownk at Haridwar bye pass, Mokampur, Azadpur Kala nearby Mahindra showroom, two fly overs towards Saharanpur Road and Haridwar buy pass, Balliwala Chowk and Ballupur which diverts the traffic.

10.13 TERMINALS

Being the capital city of Uttarakhand, Dehradun has good connectivity to other cities. Major terminals in the city are bus terminals for passengers and freight terminals for goods and services.

10.13.1 Bus Terminals

There are three different hierarchies of bus stops found in Dehradun, which are bus terminals, bus stands and bus stops. About 784 buses have been running in the study area. Dehradun has one terminal which is known as The Dehradun ISBT is located in Majra, Dehradun. The Interstate bus terminal is just at the beginning of the Dehradun entrance. The ISBT is new. Comparatively, it was earlier located near Prince Chowk. Majorly five bus services are available here the Uttarakhand State Road Transport Corporation, Uttar Pradesh Road Transport Corporation, Himachal Pradesh Road Transport Corporation, Punjab Road Transport Corporation and Rajasthan Road transport corporation, which are all Government run buses. There are private buses as well, stranded near them. Apart from that, there are six bus stands and 11 bus stops in the planning area.

Other than bus services, there are other modes of public transport, such as minibuses, electric buses, Vikram, and autorickshaws. Mini-buses do not have defined stoppages, fixed itineraries, or climate control, and most vehicles are poorly maintained from a cleanliness and comfort perspective. Vikram's also operates on the same routes as minibuses and effectively competes, especially for short-distance trips around the city centre. The vehicles are overcrowded most of the time and pose a safety hazard for commuters. The residents of the study area are majorly dependent upon the Vikram, Autos and E – rickshaws.

10.13.2 Truck Terminals

There are two truck terminals located in Dehradun city. The first terminal is in Mobewalla, located south of the city. The second truck terminal is in transport Nagar where around 200-300 trucks are parked. These trucks travel all over India, supplying goods and raw materials.

10.14 FREIGHT TERMINALS

Freight Management is an important component of city transportation planning. Freight movement is an inevitable process of trade and economy for a city. The entry of heavy commercial vehicles into the city will interfere with the easy traffic flow and thereby acts as a hindrance in the easy movement of vehicles within the city. Hence the action plans are required such that the freight movement shall not interfere with the inner-city traffic movement. Freight terminals are not existing in Dehradun city, although CMP has proposed a freight terminal at the existing Transport Nagar Area with up - gradation/ restoration facilities in Dehradun city.

10.15 PARKING

Parking is one of the major issues of Dehradun transportation is parking facilities. As vehicular numbers are increasing rapidly, parking issues are growing simultaneously. On-street parking is taking up ROWs of the roads leading to congestion. Also, many vehicles, especially two-wheelers, are parked on footpaths taking up pedestrian spaces.

Institute of Road Traffic Education prepared a Comprehensive Parking Management Plan for Dehradun City in 2013. Based on Traffic Volume and Parking Demand, Parking/ No – Parking Zones are identified in the entire city. Their details are described in the sub-sections given below:

10.15.1 Parking Lots

There are four authorised parking lots in the city under MDDA. The current space accommodation is approx. 200 cars which is not sufficient. (Source: Times of India, Dec 29.2014)

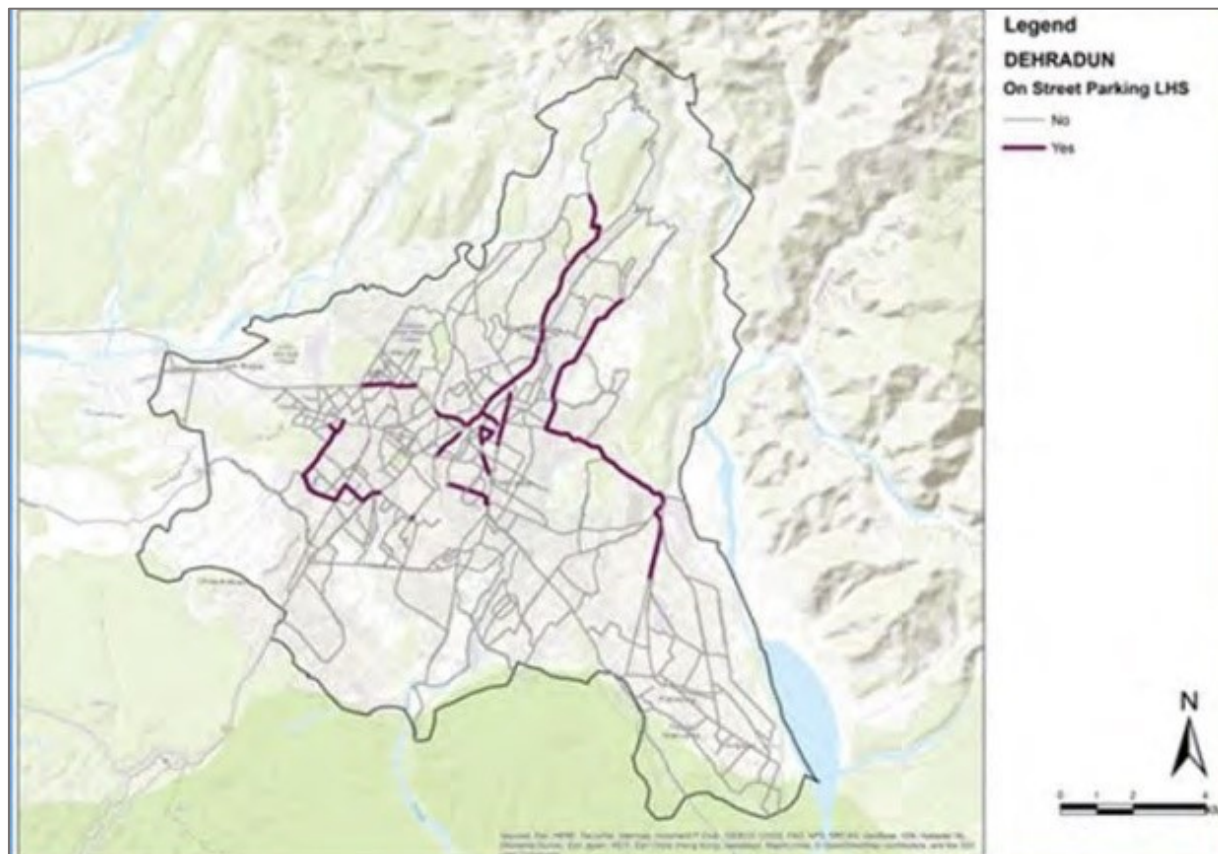
10.15.2 Parking Characteristics

Dehradun city has both on-street and off-street parking, including basement parking. The present parking facility is not sufficient. Hence, the traffic police introduced temporary parking solutions by providing white lines on wide roads for parking.

10.15.3 On-Road Parking

On-street parking is observed in all cities, specifically on prominent locations– Chakrata road, Rajpur road etc. in Dehradun, 28% of the total road network of Dehradun has on-street parking (source- CMP) 28% of the total road network of Dehradun has on street parking.

Map 10-7: Location of on street parking in City



10.15.4 Off Road Parking

According to construction norms, all commercial complexes, hotels, and other institutions must have proper parking facilities. parking spaces were found to have been turned into storage spaces for building materials in a guest house, while a shop was found running in a portion of another parking lot. Vehicles were found parked on the roadside while one of the basement parking lots was being used as a warehouse. There are multi-level parking at Rajiv Gandhi Complex and MDDA Shopping complex near Clock tower.

10.15.5 Proposed Interventions in Parking

Dehradun has proposed smart parking solutions to overcome parking issues. The proposal has also introduced an app for booking parking spaces in the city. **The Intelligent Traffic Light System (ITLS)**, based on sensor system technology, was also implemented. The objective was to signal the traffic to stop on the high side and let lighter traffic move to avoid congestion, whilst the traffic time limit was monitored manually.

Working in 27 parking lots in Dehradun, the app saves the unwanted effort of scrambling around in search of parking.

10.15.5.1 On Street Parking

Based on Parking Demand, three corridors are identified for on street parking in Dehradun planning area. Their details are given below:

Corridor – 1: Rajpur Road: The stretch witnesses a mixed land use thereby generating larger volume of traffic and parking. It is also serving the high volume of traffic for Mussoorie and Haridwar.

Corridor – 2: Chakrata Road and Ballupur Road: The stretch is densely populated due to commercial and residential activities prevailing into the area.

Corridor – 3: Haridwar Road: No Parking Zone

Due to lack of availability of road space, higher v/c ratio, lesser road width, 16 stretch are identified as no parking zones. Those 16 stretches are:

1. Saharanpur Chowk to Prince Chowk
2. Prince Chowk to Tehsil Chowk
3. Tehsil Chowk to Darshanlal Chowk
4. Darshanlal Chowk to Clock Tower
5. Clock Tower to Natraj Cinema
6. Kamla Palace Chowk to Niranjapur Mandi Chowk
7. Clock Tower to Ashley Hall Chowk
8. Eucalyptus Chowk to Dilaram Chowk
9. Darshanlal Chowk to Lansdowne Chowk
10. Lansdowne Chowk to Kanak Cinema Chowk
11. Survey Chowk to Sahashrdhara Chowk
12. Prince Chowk to CMI Chowk
13. CMI Chowk to Aaraghar Chowk
14. Nehru Colony Chowk to Rispana Bridge to Vidhan sabha Chowk
15. Nehru Colony Chowk to Dharampur Chowk
16. Dharampur Chowk to Agarwal Chowk

10.16 ISSUES AND POTENTIAL(S)

- Dehradun City is well connected with nearby Urban Centre through Road, Rail and Air.
- Railway Line Capacity of Laskhar – Haridwar – Dehradun section is already saturated. However, proposals are already in place for doubling the railway tracks into this section.
- Lack of availability of higher order road leading to congestion (especially into the Central and Southern Part) as there is more traffic than the actual capacity of the roads leading to complete halt even with slight disturbance into the flow.
- Usage of NMT (especially walk) is quite high especially into the student and non-working population. But, only 38% of the road network has availability of footpath. Among them, maximum is encroached by street vendors/ shops/ vehicles.
- Main Purpose of the trip is either work or education as it attracts vast population into the region for education and employment purpose.
- Tourists have to pass from Dehradun to reach Mussoorie. Due to that reason, during the peak seasons, it takes 4 to 5 hours to reach Mussoorie from Dehradun due to traffic Jams.
- 12 high risk zones for accidents are identified due to lack of availability of proper Junction Design/ other engineering default that needs to be taken care for safe traffic and pedestrian movement
- Only 28% of the total road network has on street parking facilities. Lack of availability of proper parking facilities especially into the commercial areas results into the road encroachment which ultimately results into the traffic congestion
- Absence of organized and integrated public transport facilities has led to increase in the share of privately owned vehicles. Majorly public are dependent upon the Vikram, Autos and E – rickshaws.
- Maximum freight traffic is passing from the city which results into the traffic congestions especially during the peak hours.
- Maximum proposals are already in pipeline especially into the sectors road development, Non-motorized Transportation and Public Transportation under Smart City Mission/ special projects announced by respected local/ state/ nation organization for betterment of the city. But, their on-ground feasibility/ viability needs to be checked as many of the sample

proposals are not found feasible during the inspection while preparation of Base Map and ELU of the planning area.

10.17 ONGOING AND FUTURE PROPOSAL(S)

There are various ongoing proposals in Dehradun Planning area to mitigate the issues of Traffic and Transportation:

10.17.1 Smart Roads

Under Smart City Mission (Area Based Development), About 10 Kms of the main city road in the ABD is proposed to be developed as Smart Roads. These Roads would be provided with a uniform carriage way, Footpaths for easy walking, Smart Parking facilities, Motion Activated Lighting etc. In these roads, electricity, water supply, telecom and data cables would be provided underground for better living, Uninterrupted provision of services under better visual experience for the road user. Their details are described in the table and figure given below.

Table 10-10: Proposed Smart Roads under Area Based Development

Sr. No.	Road	Length (km)	Phase
1	Haridwar Road (Prince Chowk – Araghar Chowk)	1.5	I
2	EC Road (Araghar – Behl Chowk)	2.9	I
3	Rajpur Road (Clock Tower- Dilaram Chowk)	1.8	II
4	Chakrata Road (Clock Tower - Kishanagar Chowk)	1.9	II
5	Gandhi Road	1.9	III
Total		10	

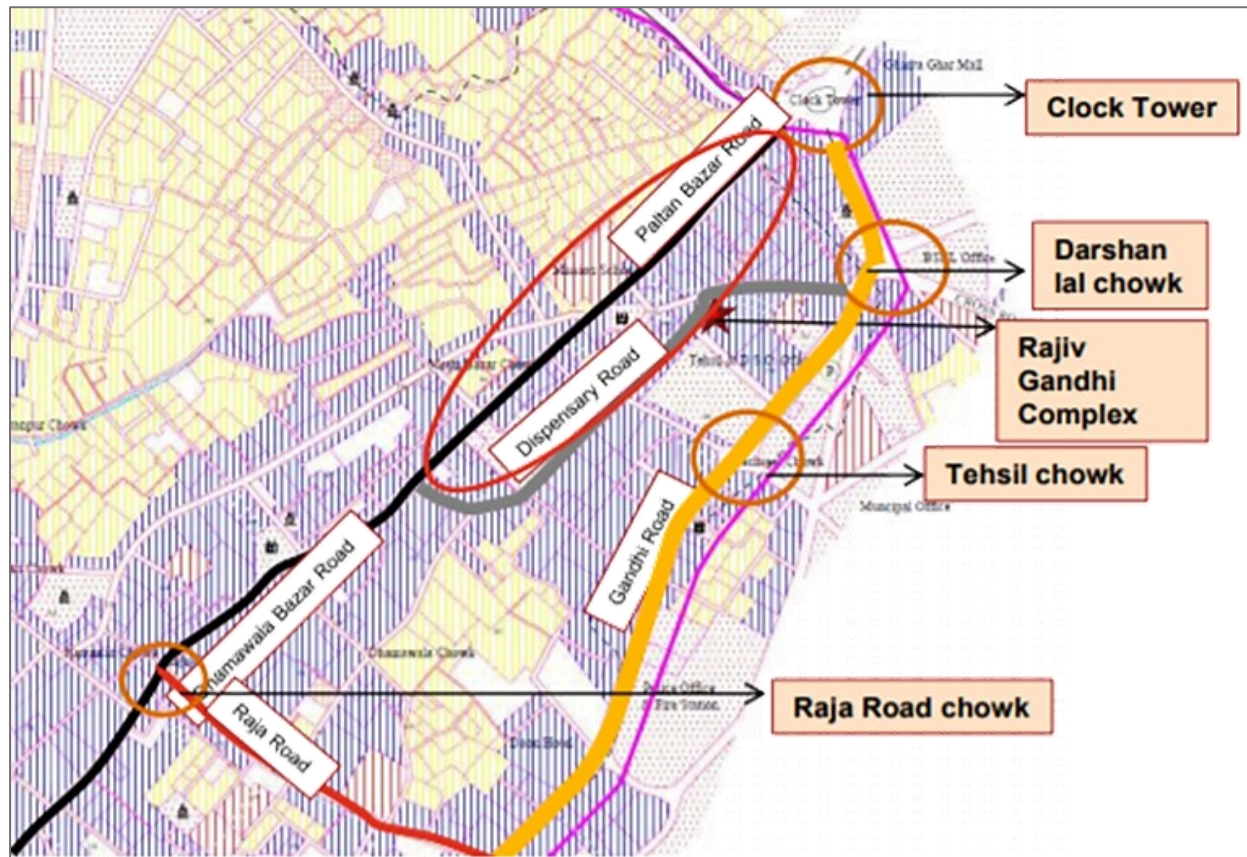
Source: <http://smartcitydehradun.uk.gov.in>

10.17.2 Street Vendor Market

Under Smart City Mission, Area Based Development Projects, Pedestrian Market is proposed at the Paltan Bazar Area. It is a Retail Market where walk and shop concept work. Lack of parking provision, no dedicated pedestrian path way, lack of availability of street furniture, encroachment on roads etc. needs especial attention. The proposed stretch is around 900m. The design is under process. Some of the important features of the proposed area is discussed below:

- Main stretch will have central 4m carriage way for battery operated rickshaw and both side pedestrian walkways having average width 3m both sides with facilities of sitting areas at 50 m intervals.
- Permissible time for vehicles for loading & unloading of goods will be 10pm to 6 am
- Unique identity creation in urban form by identical colour, & pattern in building façade and signage
- Green patches proposed along sitting areas
- LED Street Light
- Green Patches along the sitting area

Figure 10-3: Details of Proposed Pedestrian Market at Patlan Bazar Area



10.17.3 Rejuvenation of Area around DAV & DBS College

Market area between survey chowk and a college—one way and Façade improvement in colonial pattern. Provision of street furniture and beautification 5M clear carriageway width with 1.2m footpath on both sides.

10.17.4 Mass Transport System

Under 'Alternative Analysis Report for Two Corridors in Dehradun City and Corridors Connecting Dehradun, Haridwar and Rishikesh', a three-tier public transport system is proposed based on density pattern of the city.

13. First Order Transit Corridor: would act as the main public transit corridor. (Example: Heavy Metro, Medium Metro, BRT etc.)
14. Second Order Transit Corridor: would complement the First with minimal overlap so as to increase the overall reach of the First Order Transit Corridors and will enhance the population covered, by access to the public transport system (Example: City Bus, Service PRT, Cable Car etc.)
15. Third Order Transit Corridor: will provide the most important first and last mile connectivity to the First and Second Order by introducing a complementing and effective Intermediate Public Transport System in the city (feeder bus, Vikrams, Auto, E rickshaws etc.)

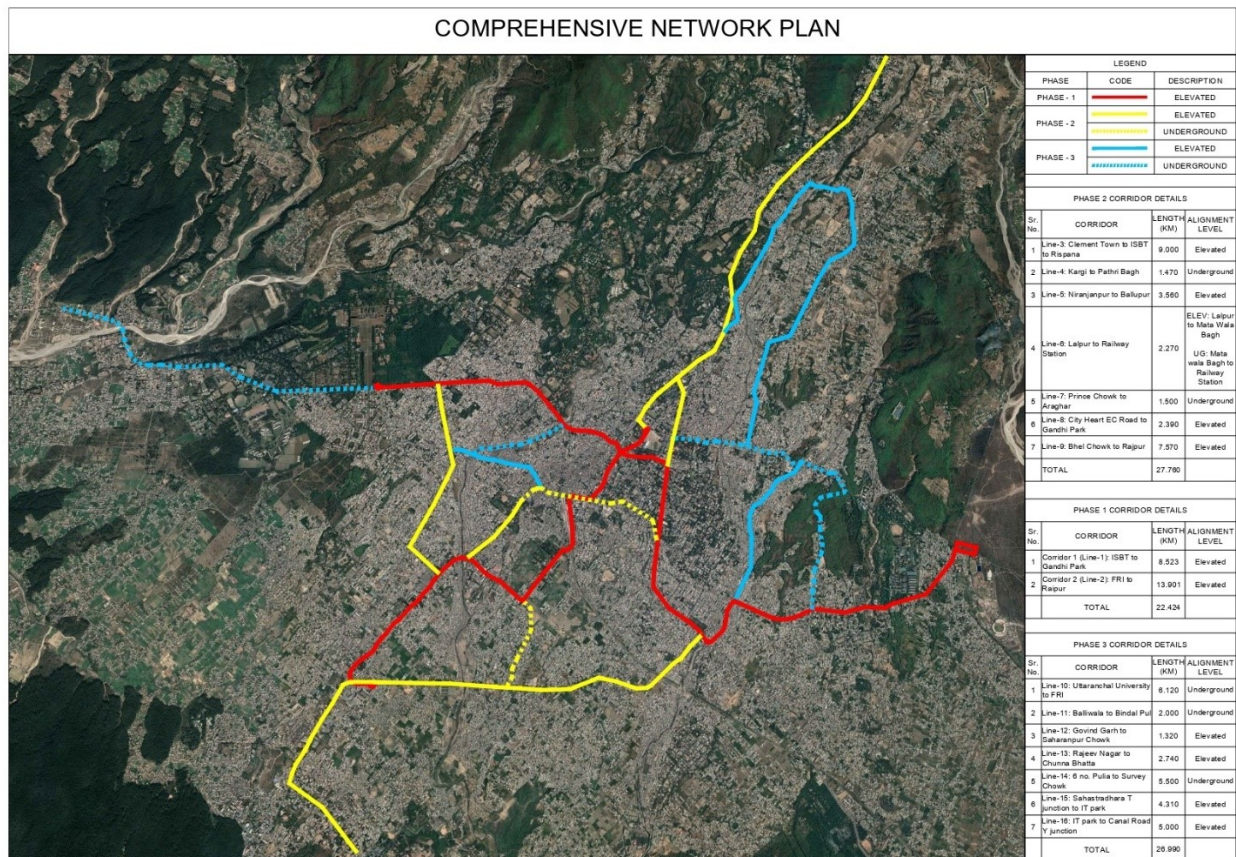
10.17.5 Neo Metro

Intra city metro proposal is already under progress for Dehradun city. The proposed Metro Neo corridors in Dehradun city area are –one from ISBT to Gandhi Park which runs north-south and another from FRI to Raipur which runs East-West. The Ghantghar Station will be the Interchange Station between the two Metro Neo Corridors.

This metro corridor is at a distance of around 1km from the main economic center of the city such as: Paltan Bazar, Raipur Bazar etc. Dehradun is also known as the educational hub of the state.

Some of the pioneer institutes are: Doon School, FRI, Military Academy etc. are at a distance of around 1 to 1.5 km from the metro corridor. But the corridors haven't covered the new economic sector developing into northern area such as IT Parks. Northern part of the city also has more growth potential so it is advisable to extend the intra city metro proposal corridor into that direction. Rajiv Gandhi International Cricket Stadium shall also include into the metro proposal as it is one of the major landmarks of the city.

Map 10-8 : Intra City Metro Proposal



Two metro corridors are proposed within the Dehradun City while one metro corridor is proposed for connecting Dehradun, Rishikesh and Haridwar. Their details are described in the sections given below:

Table 10-11: Proposed Metro Neo Corridors

Corridor no	Corridor name	Total length (km)	No of stations
1	ISBT (Dehradun) to Gandhi Park	5.523	10
2	FRI to Raipur	13.901	15
	Total	22.424	25

Source: Dehradun Metro Neo DPR 2021

Corridor-1: ISBT Dehradun to Gandhi Park (N-S corridor)

This corridor will run from ISBT Dehradun to Gandhi Park, passing through important areas such as Sewla Kalan, ITI, Chamanpuri, Pathri Bagh, Railway Station, Court, and Ghantaghar. The Corridor is 8.523 kilometres long in total. The entire corridor will be elevated, and there will be a total of ten stations along it. Reversing loops will be available at both terminal stations.

Table 10-12: ISBT (Dehradun) to Gandhi Park Corridor Stations Location

Sr.no	Station Name	Inter Distance Between Two Stations(m)	Height(m)
	Dead End		
1	ISBT (Dehradun)	320.80	17.58
2	Sewla kalan	723.66	9.80
3	ITI	916.67	9.88
4	Lalpul	1051.60	9.78
5	Chamanpuri	603.94	10.11
6	Patthri Bagh	1116.99	10.09
7	Dehradun Rly. Station	1512.12	8.84
8	Dehradun Court	945.55	9.64
9	Ghantaghar	601.92	9.33
10	Gandhi Park	458.05	10.14
	Dead End		

Source: Dehradun Metro Neo DPR 2021

1. Corridor-2: FRI to Raipur Corridor (E-W corridor)

This corridor will start from FRI station located near main entrance of FRI on the Road going to Prem Nagar. The total length of the corridor is 13.901 Km. There will be total 15 stations on this Corridor. The Corridor will pass through important areas namely Ballupur Chowk, IMA Blood Bank, Doon School, Malhotra Bazar, and Ghantaghar and pass on the Road near St. Thomas College. Thereafter the alignment runs through FSI's forest and residential areas before aligning on the East Canal Road, On East Canal Road two stations namely CCMC and Araghar Chowk are proposed. Thereafter corridor will continue to jeeavanwala, Dalanwala road and two stations are proposed namely Nehru Colony and Rispana Pul (Vidhan Sabha). Thereafter corridor will take left turn towards Raipur Road parallel to Upper Badrish Colony. Stations proposed on Raipur Road are - Upper Badrish Colony, Upper Nathanpur, Ordnance factory and Hathi Khana Chowk with terminal station as Raipur. Entire corridor will be elevated and reversing loops will be provided at both the terminal stations.

Table 10-13 : FRI to Raipur Corridor Stations Location

Sr.no	Station Name	Inter Distance Between Two Stations(m)	Height(m)
	Dead End		
1	FRI	262.123	9.467
2	Ballupur Chowk	1421.218	9.343

3	IMA Blood Bank	671.128	9.123
4	Doon School	1052.653	9.322
5	Malhotra Bazar	863.052	10.08
6	Ghantaghar	476.952	16.818
7	CCMC	1104.878	9.159
8	Araghar Chowk	794.516	9.39
9	Nehru Colony	1118.887	9.427
10	Vidhan Sabha	1034.416	9.575
11	Upper Badrish Colony	1085.630	8.983
12	Upper Nathanpur	1087.769	10.518
13	Ordinance Factory	1173.070	9.208
14	Hathi Khana Chowk	661.877	9.148
15	Raipur	597.114	8.869
	Dead End		

Source: Dehradun Metro Neo DPR 2021

2. Interchange Station:

The interchange station for both corridors is Ghantaghar station. This is planned to be a two two-levelling with the station of N-S corridor to be at first level and station of E-W corridor to be at second level but, it could be vice versa also, which is to be decided at the detailed design stage. Two spurs of 3.5 m width will be provided to connect the N-S corridor with the E-W corridor on either side of the junction station to facilitate the movement of coaches in and from the depot at Raipur. However final arrangement of connecting these corridors will be decided at the time of detailed design.

10.18 TRANSPORT POLICY

The policy consist of seven primary objectives of the Transport Policy are as follows:

1. 80:20 modal share, favouring Public Transport excluding walk trips by 2021.
2. Reduction in vehicular emissions to meet the National Ambient Air Quality Standard.
3. Achieving Zero fatality through an uncompromising approach to reduction of fatalities of all road and transport users.
4. Safety and accessibility for all through safe, convenient, comfortable and barrier-free movement for all users.
5. Bringing about a more equitable allocation of road space with people, rather than vehicles, as its main focus.
6. Affordability by providing range of mobility options for all users.
7. Efficiency in movement of people and goods

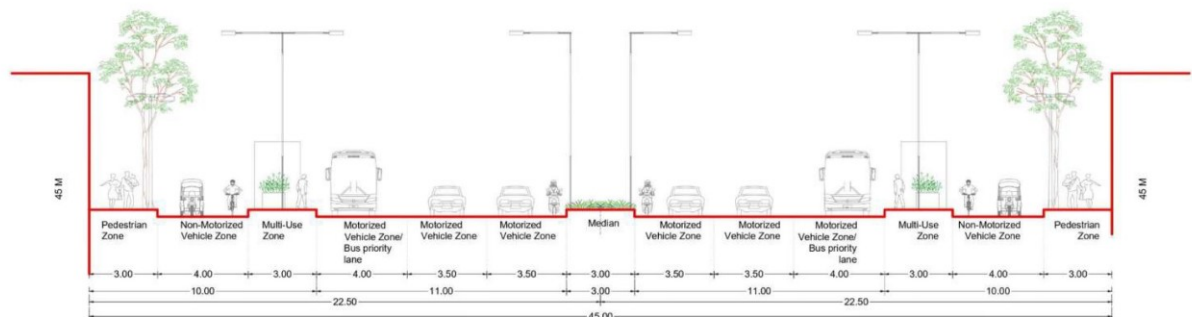
10.19 FUTURE REQUIREMENT(S)

- Higher order roads are required within the planning area for better traffic flow and reduce traffic congestion on the roads.
- Development of Bye pass road is required for connecting Dehradun with nearby Urban Centers such as Haridwar, Rishikesh, Mussoorie, Shahaspur and Vikas Nagar to reduce traffic congestion into the core and southern part of the planning area.
- Dedicated Freight corridor needs to be proposed outside the city area for restricting freight traffic entering into the city limit for better city traffic flow.
- Special Focus shall be given to the NMT Infrastructure as 28% of the surveyed population used to walk to reach their destination. Being an educational city, usage of cycle into the surveyed population is only 3% due to lack of availability of dedicated cycle lane into the area.
- Identified Critical Junctions need to be improved for ease and safer movement of the traffic
- Proper Parking Management Plan is needs to be prepared and strictly enforced as higher encroachment on roads and NMT Infrastructure results into the traffic congestion as well as safer pedestrian movement.
- Integrated and organized public transportation facility is required to reduce the usage of private vehicles, autos and Vikram which ultimately results into the better environment and healthy life of the citizens,

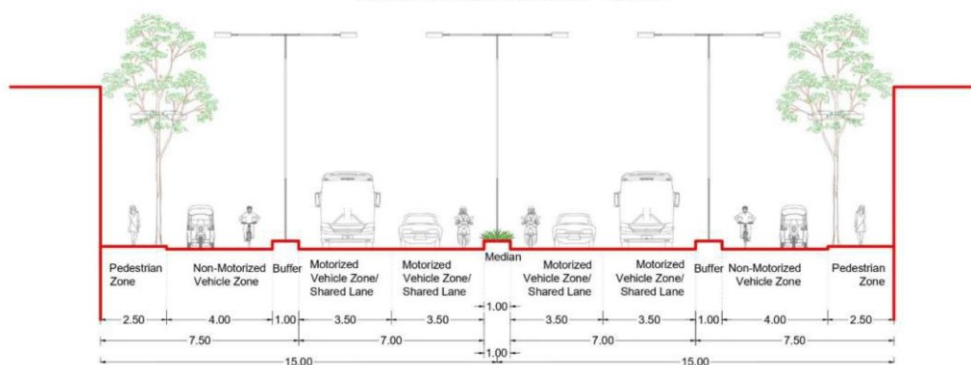
10.20 TRANSPORTATION PROPOSALS

- United Metro transport authority
- Synergy between land use and transport w par
- A new parking policy including private sector
- A new parkin policy including private development sector of parking facilities, increase in norms for parking space, multi-level parking and underground parking
- Integrated multi modal public transport system to reduce dependence on personalized vehicles
- Road and rail-based mass transport system to be major mode of public transport, optimum use of existing road network and development of missing links.
- Restructuring of existing network through expressway, elevated roads, arterial roads, distributor roads and relief roads.
- Provisions for introducing cycle tracks, pedestrian and (differently abled persons), friendly features in arterial and sub arterial roads.
- Proposed Road Sections

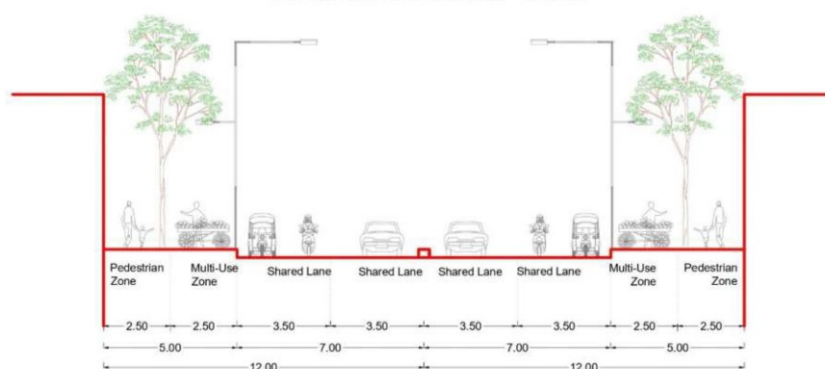
Road Cross Section - 45 m



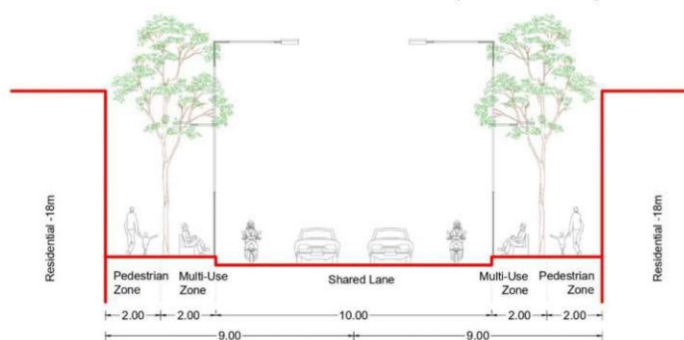
Road Cross Section - 30 m



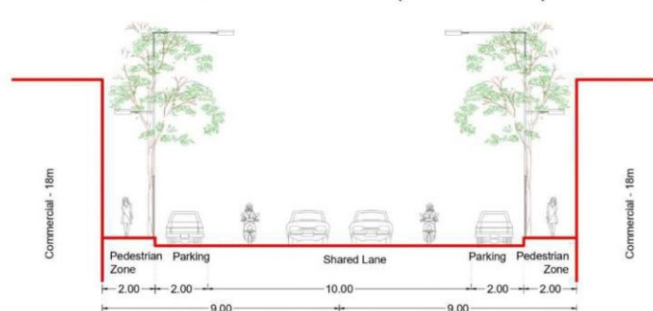
Road Cross Section - 24 m



Road Cross Section - 18 m (Residential)



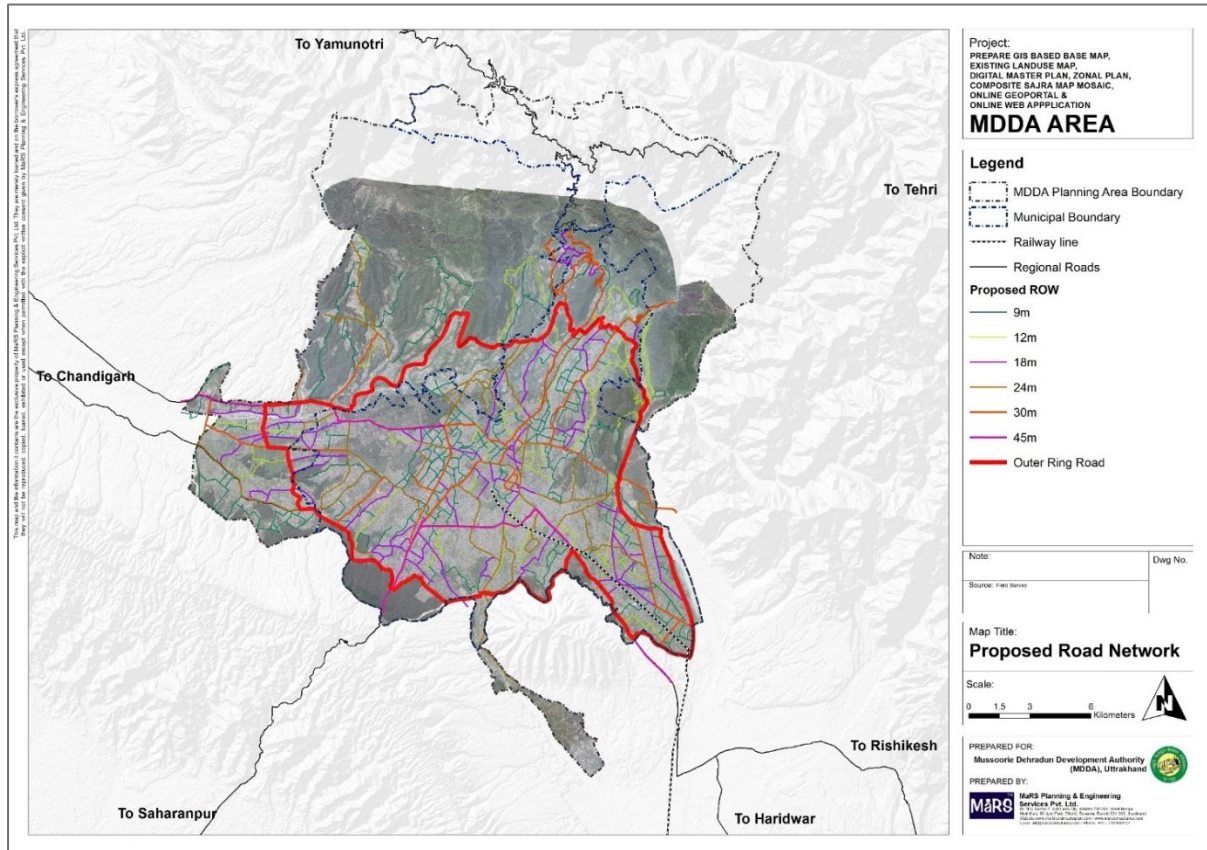
Road Cross Section - 18 m (Commercial)



10.21 ONGOING TRAFFIC NETWORK PROPOSAL

This section describes the traffic and transportation sector proposals which are currently in process; the map below defines the outer ring road and inner ring road, as well as the hierarchy of proposed roads; these roads were identified after reviewing master plan and zonal plan 2025 proposals; new settlements emerged after the master plan 2025 period; and these settlements should be connected via road with a different hierarchy of roads in master plan 2041. Because the inner city has more traffic than the outer city, the inner ring road is proposed to divert traffic in the inner city, and the outer ring road is proposed to divert freight traffic and tourist vehicles so that they do not enter the city; they can reach Mussoorie or Haridwar via the outer ring road.

Map 10-9 : Proposed Road: Currently In process



11 EXISTING LAND USE

11.1 INTRODUCTION

Understanding of existing land use and the relationships between various land uses can be applied rationally in process of preparing the future Land Use Plan. Knowledge of existing land development provides the foundation for making decisions about future residential, commercial, industrial, and various land use proposals.

11.2 PREPARATION OF BASE MAP AND EXISTING LAND-USE MAP

A detailed topographical survey or the use of satellite images in conjunction with other data sources on a GIS platform can be used to create a geographically accurate base Map. The base map for this Master Plan was created using Satellite Images and information from various department of government of Uttarakhand. Dehradun's master plan is being prepared under the AMRUT scheme, the AMRUT design and standards have been meticulously followed in the preparation of the base map and existing land use of Dehradun.

11.2.1 Importance of Base Map and Existing Land-use

A base map is a graphical representation that shows the existing physical pattern of the land upon which survey info analysis or planning proposal can be superimposed. The information required for base map varies from map to map because it largely depends upon its scale, the area covered and the level of planning details. For example, for city-level Base Map, various information is required such as;

- Planning and Administrative boundaries
- Roads
- Relief features
- Religious places
- Contours
- Apart from these, all major places of archaeological interests, public and semi-public building (important landmarks), major agricultural and city forest, district parks, gardens, green belts, floodable areas, Utilities and services lines are also shown in the base map at City level

The base map, with its corresponding representation of the topography of the territory, shows the physical reality of the area where the new city plan is to be implemented. While Land Use represents the manner of land utilisation including its allocation, development and management. Both the components are essential for the existing situation assessment for the planning area.

Base map will help to understand the basic information of the area and the same map will help in the process of reconnaissance survey and after vetting of the base map, the land use map was prepared to understand the variation in a city in context of land use. Existing land use information helps to formulate the strategies and proposals for the development-based planning. This also helps in order to achieve sustainable urban development and to check the haphazard growth and accordingly proposals are prepared.

11.2.2 Process of Base Map Preparation

Process for preparing a Base Map at a scale of 1:4000 for Dehradun Planning Area is given below:

1. **Finalisation of Planning Area Boundary-** Planning area boundary has been finalized by Mussoorie Dehradun Development authority under notification --- which consist of 100 wards along with 92 villages.

2. **Collection of Existing Data** – Existing data from all key line departments and Town Planning has been collected in the form of maps and reports and is now available in ArcGIS software in various layer formats.
3. **Data Evaluation** – The consultant assessed the data from the source to ensure its reliability, positional accuracy, and attribute authenticity.
4. **Geo referencing, Digitization and ortho rectification of the procured Satellite Image** - The Satellite imagery of the planning area boundary has been procured from NRSC Hyderabad [Panchromatic Data (0.5m resolution) + Digital Elevation Model (2.5m resolution)] after which it has been Geo-Referenced on the basis of a DGPS Survey. After that, all the physical features have been digitised from the Satellite Images. The images are ortho-rectified and submitted to the authority for approval.
5. Numbering of Building footprints and Excel Sheets/ Naming by NRSC and Issuance of PDF Field maps to Client /Consultant for field verification and spatial attribute collection NRSC provided a hard copy of 3,26,682 building footprints to the consultant. The consultant conducted a reconnaissance survey to cross-check the information and update the major land marks on the map, which was then shared with the planning cell in hard copy and an excel file. NRSC filled in the gaps and updated the information, which was then shared with the consultant in soft and hard copy for future work on the land use map.
6. Primary Data Collection

This task shall comprise extensive site surveys some of them being – DGPS Surveys of point features, Traffic and transportation surveys, Tourism Surveys, Heritage Surveys, Infrastructure Surveys and Socio-Economic Survey. The team has prepared detailed survey sheets before going on field and get it approved by the authority.

7. Incorporation of Primary and Secondary Data and Generation of Base Map

Detailed data collected from primary surveys and various departments has been updated in the form of attributes on the ArcGIS platform to develop the database for the region.

8. Vetting of Base Map

The base map has been vetted by Mussoorie Dehradun Development Authority and, Town and Country Planning Department, Government of Uttarakhand officials in various stages.

11.2.3 Finalisation of Base Map

The final base map was created after incorporating various comments received from officials during the vetting of the base map. The Consultant requested that the UD&HD provide soft copies of the field maps prepared by NRSC Hyderabad in order to save time and avoid data and information misinterpretation by both organisations (NRSC and consultant). The consultant linked all spatial attributes collected by them in the field map after receiving a soft copy of the Field Map from NRSC. The consultant's cadastral maps are also superimposed on a GIS database. On the Dehradun GIS Database, the consultant corrected drafting errors in Cadastral Maps/Joining of Village Boundaries and Dehradun Master Plan Boundary. The GIS database has been updated to include some missing roads that were discovered on the field maps.

Given table contains information on the data collected for the study area. Various combinations of this data have primarily been used to prepare existing thematic maps of land use/cover, surface water bodies, hydrogeomorphology, transportation network, flood hazard, erosion hazard, location mapping and so on.

Table 1: Collection of Secondary Data

S.No.	Data	Format	Received/ downloaded from:
1	Ambient Air Quality Data - 2011 to 2021	pdf - Tabular Format	Uttarakhand Pollution Control Board
2	Census 1971, 1981 1991, 2001, 2011- PCA Rural & Urban	Excel	Census of India

S.No.	Data	Format	Received/ downloaded from:
3	Landslide Susceptibility Analysis	pdf	Geological Survey of India
4	Foothill and Slope Analysis	pdf	Geological Survey of India
5	Alignment of proposed transmission/ feeder main of surface source water in Dehradun	pdf	Dehradun Nagar Nigam
6	Dehradun Ward Boundaries	pdf	Dehradun Nagar Nigam
7	Report on City Sanitation Plan, 2017	pdf	Dehradun Nagar Nigam
8	Land Use/ Land Cover of Dehradun City	pdf	Dehradun Nagar Nigam
9	Location of Slum areas	Image	Dehradun Nagar Nigam
10	Report on: Water Balance Plan - A Landscape assessment of Dehradun City, 2020	pdf	Dehradun Nagar Nigam
11	Contours of Dehradun city	Image	Dehradun Nagar Nigam
12	Drainage network of Dehradun City	Image	Dehradun Nagar Nigam
13	Sewerage zones of Dehradun City	Image	Dehradun Nagar Nigam
14	Waste disposal location of Dehradun City	Image	Dehradun Nagar Nigam
15	Major institutes Boundaries (FRI, ONGC)	dwg, shp	
16	Rope way alignment and contours plan	dwg, pdf	Town and Country Planning Department - Uttarakhand
17	Report on Environment Assessment report for ropeway system (Dehradun-Mussoorie)	pdf	Town and Country Planning Department - Uttarakhand
18	Existing sewerage system	pdf	Jal Sansthan Dehradun - Urban
19	Proposed Sewerage System	pdf	The Uttarakhand Urban Sector Development Agency
20	Details of Sewerage Treatment Plant	word	Jal Sansthan Dehradun - Urban
21	Details of IT Park, Pharmacy, SIDC	Excel	State Industrial Development Corporation of Uttarakhand Ltd.
22	Existing water supply System of Dehradun	pdf	Jal Sansthan Dehradun - Urban
23	Proposed water supply system master plan of Dehradun town	pdf	The Uttarakhand Urban Sector Development Agency
24	No of parks, area and dimension	word - tabular format	Dehradun Nagar Nigam
25	Students enrolled in schools, colleges, universities	pdf	Department of Higher Education, Government of Uttarakhand
26	Water Quality data of year 2011 to 2021	pdf - Tabular Format	Uttarakhand Pollution Control Board
27	Analysis Report of Sewerage Treatment Plant	pdf - Tabular Format	Uttarakhand Pollution Control Board
28	Location of Asan Wetland	shp	World Wildlife Fund

S.No.	Data	Format	Received/ downloaded from:
29	Location of Forest Fire	shp	World Wildlife Fund
30	Forest Division Boundary	shp	World Wildlife Fund
31	Boundary of Rajaji Tiger Reserve	shp	World Wildlife Fund
32	Ramsar Information Sheet - Asan Conservation Reserve	pdf	World Wildlife Fund
33	Report on: Preparation of Strategic Land and Water Management Plan for Rejuvenation of Rispana River System	pdf	World Wildlife Fund
34	Report on Rispana valley historical area	pdf	World Wildlife Fund
35	Action Plan for Rejuvenation of River Suswa	pdf	World Wildlife Fund
36	Understanding the water flows in Dehradun	pdf	World Wildlife Fund
37	Draft Zonal Development Plans and Reports	pdf	Mussoorie Dehradun Development Authority
38	Comprehensive Mobility Plan 2019 for Dehradun-Rishikesh-Haridwar Metropolitan area	Pdf	Mussoorie Dehradun Development Authority
39	Dehradun city air action plan	Pdf	Uttarakhand Pollution Control Board
40	Master Plan 2025 for Dehradun City	pdf	Mussoorie Dehradun Development Authority
41	Master Plan for Doon Ghati Special Development Area	Pdf	Mussoorie Dehradun Development Authority
42	Alternatives Analysis Study Report for 2 corridors In Dehradun City and corridors connecting Dehradun, Haridwar and Rishikesh as per Comprehensive Mobility Plan for the Metropolitan Area, 2019	Pdf	Uttarakhand Rail Corporation Limited
43	Comprehensive Parking Management Plan of Dehradun, 2013	Pdf	Town and Country Planning Department - Uttarakhand
44	Strategic Guidelines for Making River Sensitive Master Plan, 2021	Pdf	National Institute of Urban Affairs
45	River Centric Urban Planning Guidelines	pdf	Ministry of Housing and Urban Affairs, Government of India
46	Detailed Project report for metro neo project in Dehradun, 2021	Pdf	Uttarakhand Rail Corporation Limited
47	Affordable Housing locations and name	Image	Mussoorie Dehradun Development Authority
48	Tourist Locations and Accommodation services	Links	https://uttarakhandtourism.gov.in
49	Details of Post office in Dehradun	word - tabular format	Post office - Dehradun
50	Solid Waste Collection location points and other details	Excel	Dehradun Nagar Nigam

S.No.	Data	Format	Received/ downloaded from:
51	Location and Details of Police Stations	Links	https://www.google.com/maps/d/u/0/embed?mid=1AxC-ka8bZNu5R4-fi1zYLMtWDIsJmDko&ll=30.351051348966873%2C78.04743035021033&z=11
52	Details of Traffic Signals	Links	https://dehraduntrafficpolice.uk.gov.in/Trafficsignal
53	Details of Black spots	Links	https://dehraduntrafficpolice.uk.gov.in/Blackspots
54	Boundary of cantonment area	shp	
55	Locations of rivers, canals, and nalas	Kmz	Irrigation Department
56	Natural Gas line	Image	Gas Authority of India Limited

Source: Various Authorities

11.2.4 Land-use Survey

A primary survey was conducted to document the area's existing land use, which included the types of land use such as residential, commercial, mixed land uses, public and semi-public, recreation and open space, and so on. The consultant transfers these changes in the final base map based on the collected data, survey, and interpretation of the NRSC field maps. The consultants create an existing land use map incorporating the features specified in the URDPFI and AMRUT design and standards.

11.2.5 Digitation of Maps

As per the AMRUT guidelines, maps are prepared at 1:4000 scale. Below table defines the spatial layer and sources those are digitised for the preparation of the Base Map of Dehradun Planning Area along with the class and sub class.

Table 3: Geo Spatial Data Content

SI No.	Spatial Layers	Source for Spatial data generation	Classification based on Use & Attributes	
			Classes	Sub Classes
I	Base layers	Very High-Resolution satellite data	5	46
	1. Road			
	2. Rail			
	3. Bridges			
	4. Flyovers			
	5. Water bodies			
II	Urban Land Use/Land cover	Very High Resolution satellite data	28	220
III	Building Footprints	Very High Resolution satellite data	22	144
IV	Utilities			

SI No.	Spatial Layers	Source for Spatial data generation	Classification based on Use & Attributes	
			Classes	Sub Classes
V	1. Water Supply Network	Urban Local Bodies	1	12
	2. Storm Water Drainage Network		1	2
	3. Sewerage Network		1	8
	4. Power Supply Network		1	8
	5. Gas Distribution Network		1	6
	Hypsography	Topographic Survey; existing DEMs or contour maps.		
	1. Digital Elevation Model (DEM) Type: Digital Terrain Model (DTM)		1	1
	2. Contour		1	1
	3. Ground Control Points		1	2
	Cadastral Layer	Urban Local Bodies/ State Revenue Department	1	-
VII	Boundaries			
	1. Administrative boundaries	State Revenue Department	1	7
	2. Planning boundaries	Urban Local Bodies	1	8
	3. Municipal boundaries	Urban Local Bodies	1	4
	4. Other Boundaries – Enumeration Block (EB), Urban Framework Survey (UFS) & Mining Area	EB from Registrar General of India (RGI), UFS from National Sample Survey Organisation (NSSO) & Mining area boundary from concerned State Departments.	1	3
VIII	Hazard Prone Areas	Information from NRSC, ISRO, GSI, NDMA, Other State & Central Government Dept.	1	3

Source: Design Standards, AMRUT

11.2.6 Sajra Map Digitisation

Out of 177 villages of Dehradun Planning Area, Sajra sheets has been prepared and approved for the 155 villages by the department.

11.2.7 Details of Base Map

Base map is prepared on GIS software of MDDA area, details are given below in tabular form for the better understanding of layers used to prepare base map.

Table 2: Details of the Layers of the Base Map

S.No.	Layer Name	Vector Representation	Attribute Data
1.	Municipal Boundary	Polygon	ID and ULB Name
2.	Area of Interest Boundary	Polygon	DEVELOPMENT AUTHORITY/ ULB Name
3.	Ward Boundary	Polygon	ID, Ward No. Zone No. and Ward Name
4.	Zone Boundary	Polygon	ID, Zone No., Zone Name
5.	Industrial Zones/Area	Polygon	ID, Locality
6.	Colony Boundary	Polygon	ID, Ward No, Name
7.	Slum Boundary	Polygon	ID, Slum No., Locality
8.	Reserved Forest/ village forest boundary/ Van Chokies	Polygon	type of forest; RF/ VF
9.	wholesale markets/ veg and grain market	Polygon	Area in sq.mt.
10.	Streams/Drai nage/ Canal	Polygon	ID, Type of water bodies
11.	Over Head Tanks	Polygon	ID, Ward No., Locality, Road ID, Capacity, Status
12.	Landfill Site	Polygon	ID, Road ID, Ward No., Locality
13.	DGPS Points	Point	ID, Latitude, Longitude, Height
14.	Sewerage Network/ Drainage Network	Line	
15.	Water Supply Network	Line	It should be as per format given in Annexure II.
16.	Drainage Pumping Station	Point	ID, Road ID, Capacity, Ward, Locality, Description
17.	Water treatment plant	Point	ID, Road ID, Capacity, Ward, Locality, Description
18.	Fire Stations	Point	ID, Road ID, Capacity, Ward, Locality, Description
19.	Garbage Collection Points - Secondary	Point	ID, Road ID, Ward, Locality, Garbage Type, Status, Coverage Area (No. of Houses/ Colonies)
20.	Slaughter House	Point	ID, Road ID, Ward No, Locality

S.No.	Layer Name	Vector Representation	Attribute Data
21.	Bridges/ Flyover	Line	ID, Road ID, Ward No, Locality, Bridge type, Length, Width, Construction Material, Construction Year
22.	Parks/Garden	Polygon	ID, Road ID, Ward No, Locality, Type, Name
23.	Tube Well	Point	ID, Road ID, Ward No, Locality, Description, Status
24.	Hand Pump	Point	ID, Road ID, Ward No, Locality, Description, Status
25.	Community Toilet	Point	ID, Road ID, Ward No, Locality, Description, Status
26.	Water Pumping Stations	Point	ID, Road ID, Ward No., Locality, Description, Status
27.	Traffic Square	Point	ID, Road ID, Name
28.	Railway	Line	ID, Type
29.	Contours	Line	ID, Height
30.	Power Supply Network	Line	ID, Type (11KV/ 33KV)
31.	Electric Transformers	Point	ID, Road_ID
32.	Landmarks	Point	ID, Road ID, Ward, Locality, Type, Name, Description, Status
33.	Road Network	Line	Road ID, Type, Road Median (Yes/No); Construction Material, Name, Carriage Way width, ROW width,
34.	Carriage Way	Double Line	ID, Road ID, Width
35.	Right of Way	Double Line	ID, Road ID, authorized Width
36.	Footpath	Line	ID, Type, Road ID, Construction Material, Width
37.	Transport Terminals; road/air/rail	Polygon	ID, Type, area in sq.mt.
38.	Sewerage Treatment Plant and Sewerage Pumping Station	Point	ID, Road ID, Type (STP/SPS) Capacity, Ward, Locality
39.	Cell Phone Tower/ Telephone Tower	Point	ID, Ward No., Locality, Road ID, Parcel ID, Description
40.	Bus Shelters, Bus terminals	Point	ID, Ward No., Locality, Road ID, Description
41.	Cadastral Map/Town Survey Maps	Polygon	ID, Khasra No/property number.

S.No.	Layer Name	Vector Representation	Attribute Data
42.	UTILITY PLANS	LINE	ID, Road ID, Ward No, Locality, Description, Status

Source: Project RFP

11.2.8 Preparation of Land-use Map

Steps for preparation of Land use map at a scale of 1:4000 for the Dehradun Planning Area is discussed below:

- 1) Finalisation of Planning Area Boundary
- 2) Base Layers (Board Land Uses, Roads, Building Footprints) received from UDD for the AOI Boundary along with the sheets
- 3) Ground Truthing and necessary modifications by the consultants in the Base Layers
- 4) Submission of modified sheets to NRSC after scanning
- 5) Data has been feed by NRSC into the submitted scanned sheets and shared to the Authority
- 6) Ground truthing and necessary modification by the consultant
- 7) Ground Truthing and vetting by MDDA and TCPD Officials
- 8) Modifications in the existing land use by the consultant based on the comments received from MDDA and TCPD Officials
- 9) Submission of Final Existing Land Use to the Authority for Approval

11.2.9 Ground Truthing and Vetting

For preparation of Base Map and Existing Land Use, surveys have been conducted by the consultant in the months of August 2021, September 2021 and October 2021. The vetting for the same has been conducted by the MDDA and TCPD officials in the months of June 2022 and July 2022. After incorporating all the comments by the consultant, authority has provided the final approval on 13.07.2022.

Figure 11-1: Ground Truthing by TCPD officials



Figure 11-2: 7) Ground Truthing and vetting of ELU by MDDA and TCPD Officials



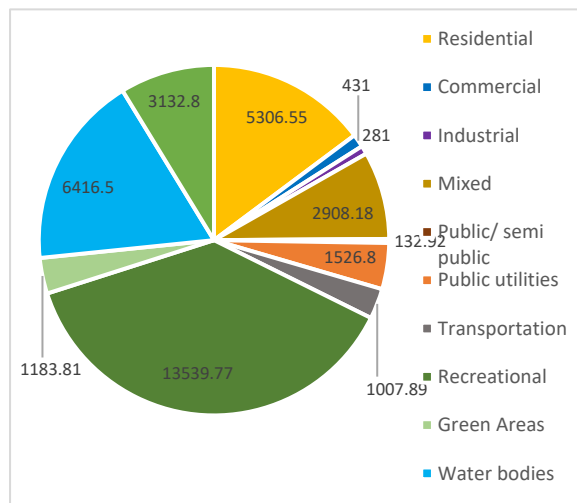
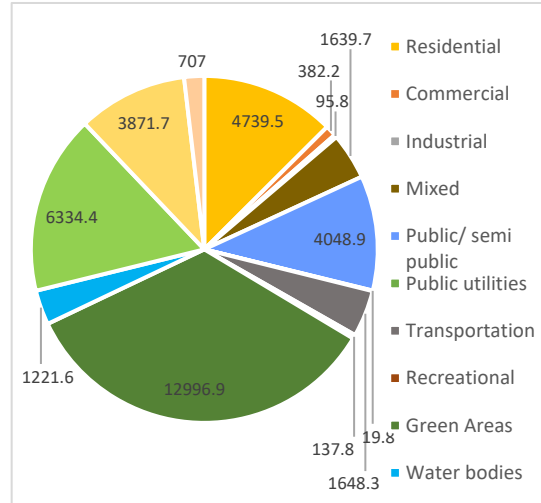
11.3 EXISTING LAND USE

The Study of the existing land use pattern reveals that over the year's city has spread more in north, south – east and south west direction along the major roads those are connecting Dehradun Municipal Corporation (DMC) to Mussoorie in north direction, to Doiwala in south east and to Sahaspur in south west direction.

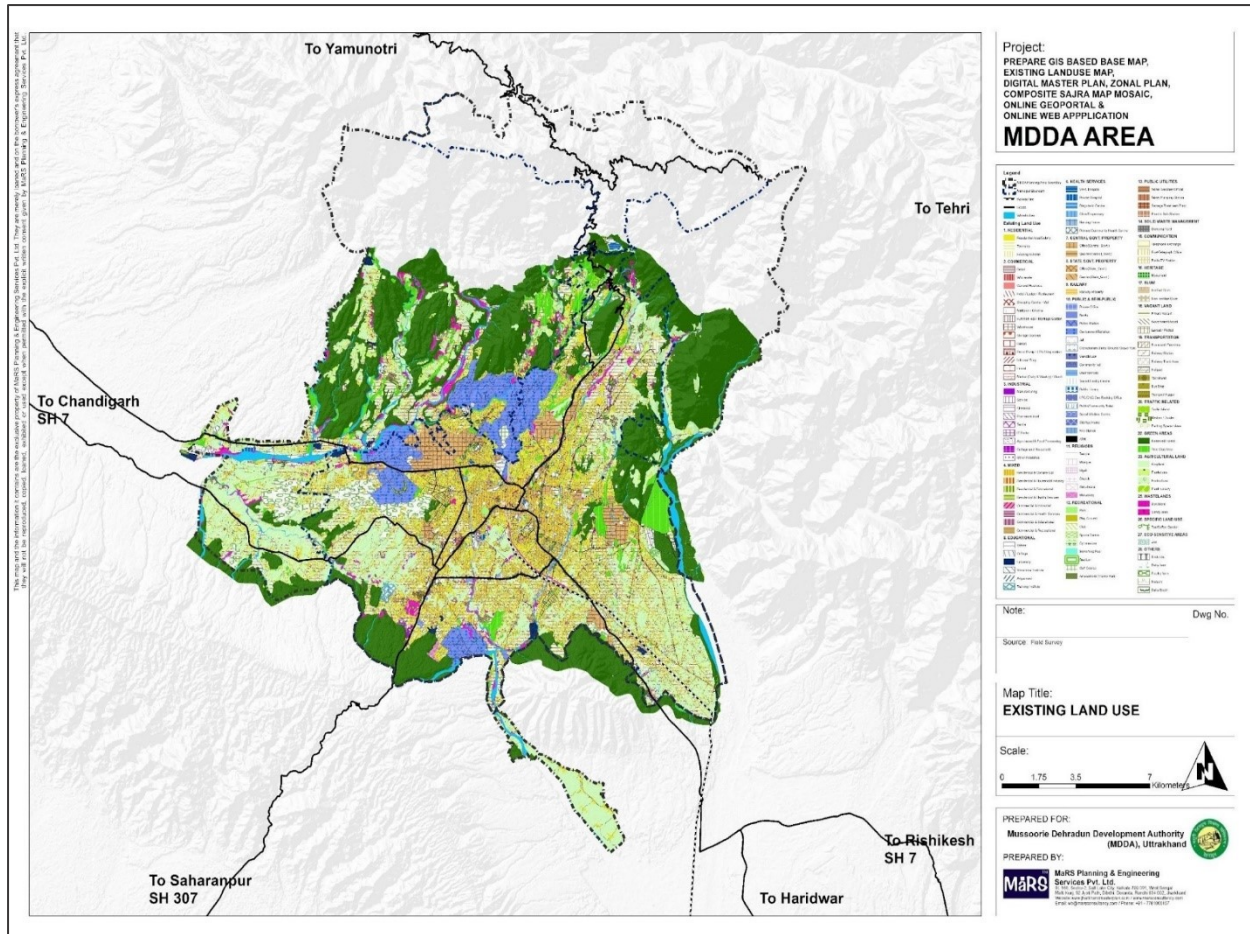
The total area of Dehradun is 378.42 sq.km. Among them, 125.7 sq.km area is already developed which is around 33.22% of the total planning area and 252.72 sq.km. area is undeveloped which is 66.78% of the total planning area. After deducting the area under conservation (Water Bodies and Green and Eco – Sensitive Areas), Net area available for the future development is 28.75 sq.km. If we compare the share of various land uses of developed area with the URDPFI standards, it is clearly observed that the share of commercial, industrial and commercial use needs to be increased in planned manner in 2041 Master Plan. The details of various land uses have been described in the table given below:

Figure 11-3: Existing Land Use of Dehradun Planning Area

Land Use	Master Plan 2025 (In Ha)	Master Plan 2025 (In %)	ELU 2021 (In ha)	ELU 2021 (In %)	Developed Area (In %)	URDPFI Recommendations (In %)
Residential	5306.55	14.79%	4739.5	12.52%	35.52%	36-39
Commercial	431.00	1.20%	382.2	1.01%	3.07%	5-6
Industrial	281.00	0.78%	95.8	0.25%	0.66%	7-8
Mixed	—	—	1639.7	4.33%	15.33%	—
Public/ semi public	2908.18	8.11%	4048.9	10.70%	31.20%	10-12
Public utilities	132.92	0.37%	19.8	0.05%		
Transportation	1526.80	4.26%	1648.3	4.36%	13.11%	12-14
Recreational	1007.89	2.81%	137.8	0.36%	1.10%	14-16
Green Areas	13539.77	37.75%	12996.9	34.34%	—	—
Water bodies	1183.81	3.30%	1221.6	3.23%	—	—
Agriculture	6416.50	17.89%	6334.4	16.74%	—	—
Defence area	3132.8	8.73%	—	—	—	—
Vacant land	—	—	3871.7	10.23%	—	—
Waste land	—	—	707	1.87%	—	—
Total	35867.22	100%	37843.6	100%	100%	—

Figure 11-5 : Land use as per ELU 2022

Figure 11-4 : Land Use as per Master Plan 2025


Map 11-1: Existing Land Use of Dehradun Planning Area



11.4 SECTOR WISE ANALYSIS OF EXISTING LAND USE(S)

The description of various land uses has been given in detail as below:

11.4.1 Residential Use

The residential activities are majorly concentrated in the existing town area. Most development is observed along or parallel to the major corridors next to the mixed-use development. At present, the existing residential area is 44.65 sq. km. which includes approximately more than 2,00,000 of building units. The prominent residential areas are: Rajpur Road, Indra Nagar, Nehru Colony, Niranjapur, Subhasnagar, Ballawala, Naya Nagar, Prem Nagar etc.

11.4.2 Commercial use

A scattered concentration of commercial use along the main roads has been observed in the Dehradun Planning Area. These include retail, wholesale, general business store, hotels/ restaurants, shopping centres, Multiplex/cinemas, function halls/ marriage halls, resorts, warehouses, storage godowns, fuel stations, hostels, daily and weekly markets etc. The existing main shopping centres are concentrated mainly in the core city area named as Paltan Bazar, Tibetan market, Rajpur Road, Indra Marg, Gandhi Road etc. At present, the commercial area in the Dehradun Planning area is only 3.62 sq.km which is only 3% of the total developed area.

11.4.3 Mixed Use

In Dehradun Planning Area, mixed-use development is often observed in the developed area, especially along the main roads and in and around the main market areas where the ground floor or first two floors has been used for commercial purpose, and the floors above are being used

mainly for residential purpose. At present, the existing mixed-use area comprises 19.28 sq. km. which is around 15% of the total developed area

11.4.4 Industrial use

Industrial activities have been observed near Raipur Road, Saharanpur Road and Haridwar Road in very small pockets. Currently, the area under industrial use is only around 0.83 sq. km which is 0.6 per cent of the total developed area. While preparing the proposed land use for the Dehradun Planning area, dedicated industrial patches need to be given based on the demand, terrain and ecological parameters.

11.4.5 Public & Semi-Public and Utilities Use

Being a State Capital and Education Hub of Uttarakhand, around 39 sq. km. the area is available under public – semi-public use, around 31 per cent of the total developed area. Having the status of the capital city, Dehradun is equipped with various services, state and central government offices and specialised institutes. This area of PSP includes education & health services, central & state government properties, public utilities such as water & sewerage treatment plants & garbage disposal sites, communication services etc.

11.4.6 Recreational Use

At present, recreational area is only 1.38 sq.km which is only around 1% of the developed area. As per the URDPFI Norms, area under recreational activities should be around 14 to 16 percent of the developed area for the better lifestyle of its citizens.

11.4.7 Transportation

The Major city traffic and transportation system takes place on main roads such as: NH 7, NH 307, Rajpur Road, Saharanpur Road, Kanwali Road, Chakrata Marg, Cant Road, Mall Road, Raipur Marg, Shahastradhara Road etc. At present, area under traffic and transportation is 16.48 sq.km. which around 13 percent of the total developed area. The existing roads are well inter-connected with the different localities of the core city. However, roads in the outskirts are not so well developed and sparsely distributed. In core Dehradun also, frequent traffic congestion and bottlenecks are the major problems, which need to be tackled.

11.4.8 Agriculture Land

At present, agricultural land is around 61 sq.km. which is nearly 16% of the total planning area. As already mentioned, there are 72 villages in Dehradun Planning Area. In many of the villages, majority of rural population are engaged agricultural activities.

11.4.9 Water Bodies

Dehradun has 3 major rivers and number of nallahs and sub nallahs which are natural drains for rain waters. At present, around 12 sq.km. area is under water bodies which is nearly 3% of the total planning area.

11.4.10 Greens and Eco-Sensitive Areas

The entire Dehradun Planning Area falls under the Doon valley is the second ecologically sensitive area to be notified by the MoEF. Currently, area under Greens is around 131 sq.km, which is nearly 35% of the total planning area.

11.4.11 Vacant and Waste Land

Area which is for future development under vacant and wasteland around 46 sq.km. which is nearly around 12 percent of the total planning area.

11.5 SPECIAL AREAS

The cantonment area is considered in special area of Dehradun. The total area of cantonment area is 18.755 km sq. The total population of this Cantonment as per the latest census of 2011 is 52,716.

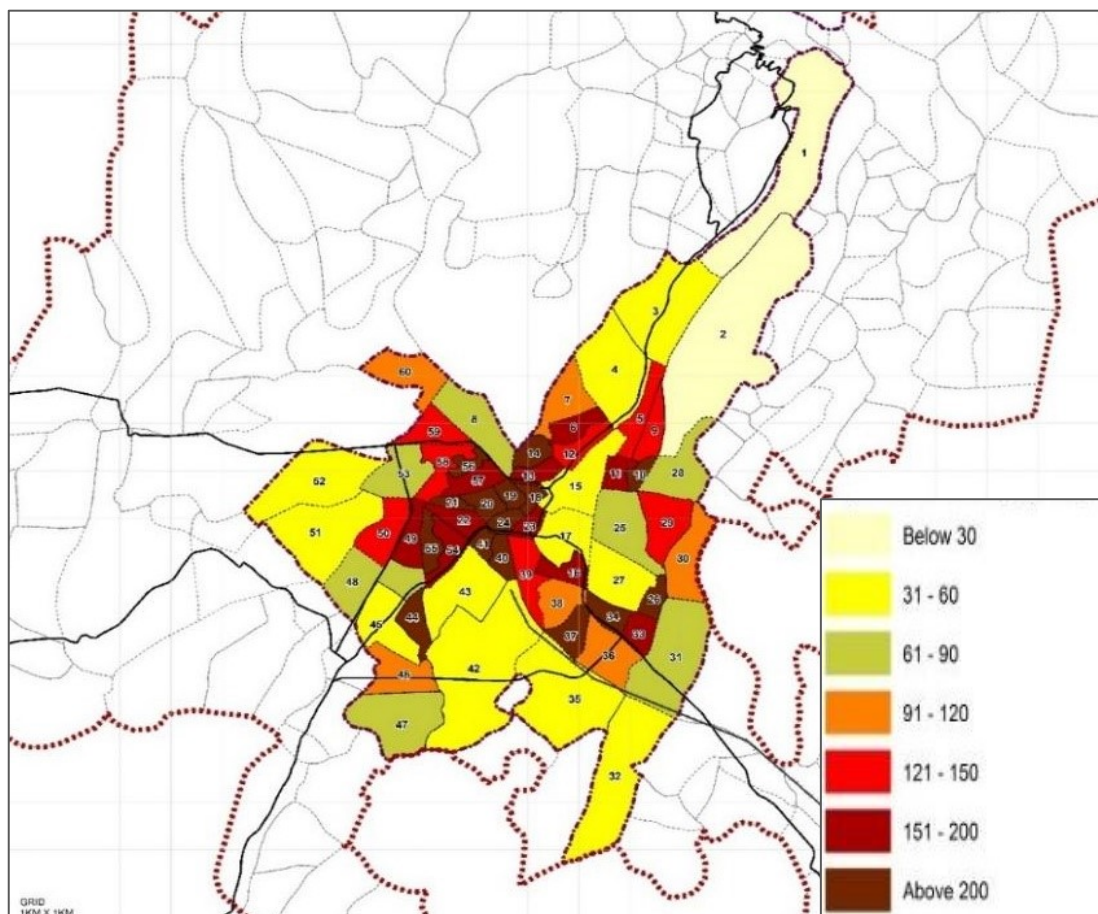
11.6 MAJOR CONSTRAINS OF DEVELOPMENT

Higher Residential densities, Existing Development Pattern, Low lying areas especially near to the rivers and vulnerability to the natural disaster and so on are the major constraints of development in Dehradun planning area. Each constrain is explained in detail in the sub sections those are given below:

11.6.1 Residential Density

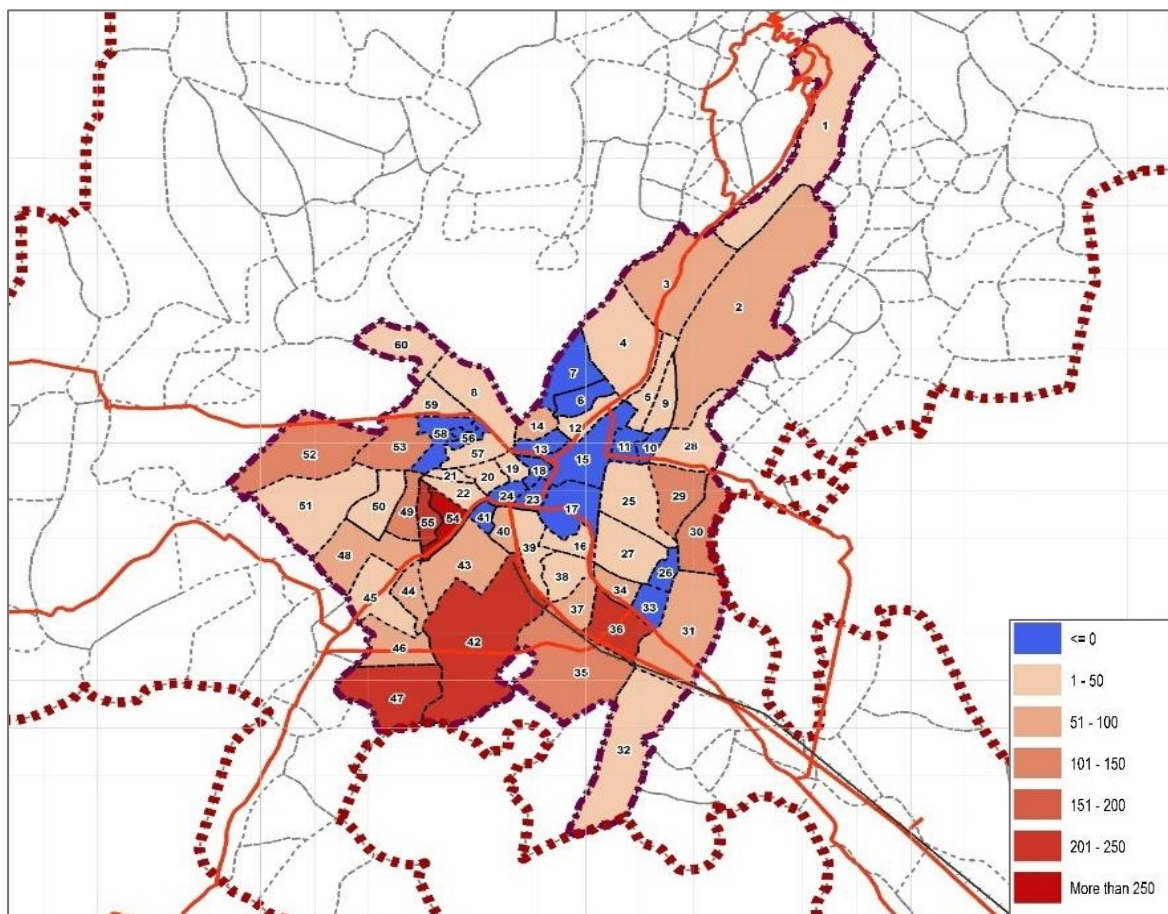
As per URDPFI Norms, developed area density in large cities should be around 125 – 175 PPH. As per census 2011, maximum wards in the core city areas are having population densities above 200 PPH which ultimately results into the negative growth rate as shown in figure 2 and 3.

Map 11-2: Residential Density



Source: Census 2011

Map 11-3: Decadal Growth Rate from 2001 to 2011



Source: Census 2011

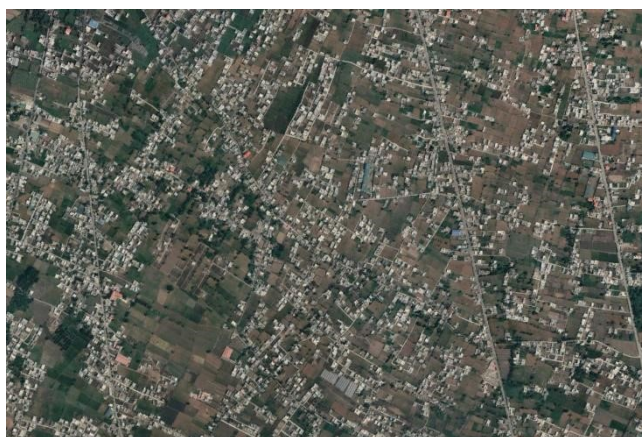
11.6.2 Eco Sensitive Areas

The entire planning area is located in the Doon Valley which is notified as an Eco – Sensitive Area by the MoEF in October 1988. After which all the mining activities were closed down by the Supreme Court in December 1988. Dehradun Planning Area is bounded in the north-east by the lesser Himalayan ridge, in the south-west by the Shivalik ranges, the Ganga in the south-east and Yamuna in the north-west. Furthermore, the Rajaji National Park, Rajaji Sanctuary, Motichur Sanctuary, Chilla Sanctuary, Elephant Reserve, Asan Conservation Reserve are within or near or adjoin to the planning area boundary. The main purpose of the declaration of the Eco sensitive areas is to prohibit/ restrict the development activities to protect them.

11.6.3 Existing Development Pattern

The majority of new development in the Dehradun Planning Area is taking place in areas where adequate roads and other infrastructure are lacking, or where access to the property is extremely limited. Furthermore, especially in the 40 new wards, maximum development has been observed only along major roads in a scattered manner, resulting in a lack of proper utilisation of available land resources.

Figure 5: Development Pattern in Dehradun Planning Area



Source: Google Earth

11.6.4 Major Rivers and Low-Lying Areas

Rispana and Suswa are the two major rivers those are passing within the Dehradun Planning Area. Due to lack of implementation of the building byelaws and high migration rate for a better lifestyle, informal settlements have been formed on the river bed with no margins and setbacks making them vulnerable to natural disasters.

Being the foothills of the Himalayan Mountain Ranges, the city has the adequate natural drains. But due to the urbanisation and encroachment in to the catchment areas often results into the flooding situation especially in the low-lying areas such as: ISBT, Ballawala, Basiwala, Bindal, Rispana.

Figure 6: Informal Settlement along the river



11.6.5 Existing Road Network and Missing Links

As far as the Existing Road Network has been concerned, out of the total road network, more than 60% roads are having ROW less than 18m. Lack of availability of the higher order roads within the city leads to traffic congestion, implementation of proper NMT Infrastructure, difficulties in the on-street parking facilities and so more.

Furthermore, due to lack of implementation of the building byelaws in the planning area results in to the haphazard development. As mentioned in the section 11.6.3., majority of the new development coming up in the areas where sufficient provision of roads and other infrastructure is not available or the access are really narrow to reach to the property.

Moreover, on-street encroachments of vehicles and commercial shops, especially at junctions as discussed in chapter 8 causes traffic congestion and lead to vehicular and pedestrian conflicts. NMT and pedestrian facilities are also not sufficient. Furthermore, there are no cycle tracks in the city.

11.6.6 Slope Analysis

The slope of Dehradun is above 45, which is the highest in the north due to the hills. The south of the city has the lowest slope between 0-10, and the rest of the area lies between approximate slope of 10-30 degrees.

11.6.7 Natural Hazard Vulnerability

Dehradun District is coming under the earthquake zone IV. Various Fault lines are passing within the planning area boundary which makes it more vulnerable to earthquake. As far as the floods are concerned, the problem of floods is mainly observed in Dehradun district especially in the blocks such as Sahaspur, Vikas Nagar and Doiwala. Various rivers are flowing down from Dehradun and Tehri Garhwal districts assemble their flow in these blocks. Few of these rivers are Ganga, Song, Suswa, Rispana, Tons and Asan. All the mentioned rivers pose a big threat of flood in the rainy season.

11.7 REVIEW OF PREVIOUS MASTER PLAN (S) AND ZONAL DEVELOPMENT PLAN

Details of the earlier Master Plan 2022 is described into the sub-sections given below:

11.7.1 Introduction to Old Master Plans

After the establishment of the MDDA Planning area in the year of 1984, first Master Plan was prepared in the year of 1985 for the plan period of 2001. After the publication of final Doon valley notification in the year of 1989, New Master Plan was prepared for the plan period of 2005 – 2025. Till 2013, the Master Plan was on hold by MoEF under the Environmental Protection Act 1986. Finally in 2013, the revised Master Plan 2025 was prepared for the planned development in the region.

11.7.2 Review of Master Plan 2025

The master plan 2025 is divided into ten chapters, the first of which discusses the planning area's background, including natural features, history, and planning area. The following chapter discusses land use change from 2001 to 2005, taking into account all major land uses such as residential, commercial, industrial, public/ semi-public, transportation, and reserved areas, as well as their relative uses. The chapter also mentions the villages that have been added under the MDDA jurisdiction. Chapter 2 is a detail of Demography, with figures for population, decadal growth, density, family size, and projections for 2025. The following chapter discusses housing conditions through family housing numbers and typologies with family sizes. The fifth chapter discusses the economic foundation, which includes industries, tourism, retail, wholesale, government offices, and so on. Furthermore, the Master plan discusses social services such as education, health, and police, as well as utilities such as water, sewerage, sanitation, and electricity. The report also covers transportation, such as connectivity, railways, road classification, and current issues.

The report mentions the proposals for various land uses after identifying issues and future population demand. Apart from electricity, education, and water demand infrastructure provisions, some of the significant proposals identified are slum improvement provisions by accommodating 30% of slum areas for commercial purposes, followed by services provision and proposal of a 70-hectare regional city park with government offices. Proposal of parade ground will be converted into a modern stadium for national-level games. Transportation proposals include parking and green belt along the roads, road widening of the Saharanpur Road and other congested areas, 15 flyover proposals, a reserved area for railway activities along the railway station. Proposals for wholesale markets, Tibetan markets, vendor markets and parking along commercial strips, and furthermore, proposals to improve industries are mentioned in the report.

Master plan has a proposals and Industrial policy for Mobbewalla area expansion for industrial activities such as food processing, industrial area development, and small-scale household industries. As an ecologically sensitive zone, the master plan was also focused on preserving the environment and green areas; thus, significant proposals were made, such as advice to maintain

ecological balance within industrial areas, promotion of green regions, promotion of horticulture and afforestation through gardens and parks, and prevention of soil erosion along the Natural Drains. Rainwater water harvesting and groundwater preservation are two other environmental proposals. Dehradun MDDA was previously divided into 27 zones, but after public hearings and stakeholder involvement, the proposed zones were reduced to eight.

11.7.3 Review of Zonal Development Plan

There are 9 zones identified in the planning area, each with its own zonal development plan. To maintain consistency, all nine zonal development plans have the same content and report framework. The plans cover six chapters in total. The first chapter covers the introduction, urban centres, regional setting, approach, and methodology of Zonal Development plans, which are shared by all nine plans. The following chapter discusses the master plan profile and population, as well as a comparison of specific zone population and economic profile. The third chapter covers major physical infrastructure such as water supply, sewerage, sanitation, and drainage, as well as social infrastructure such as education, public health, and recreational facilities.

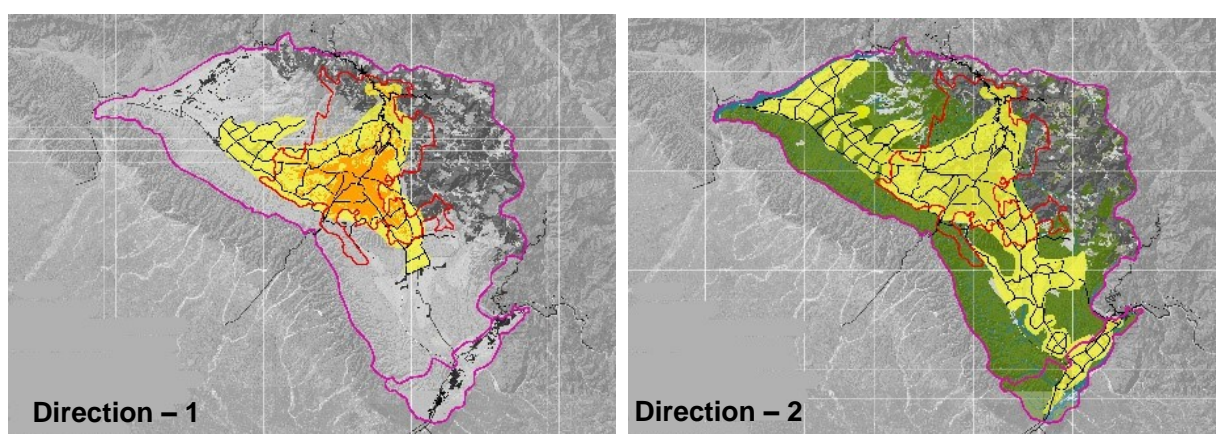
The reports also discuss traffic and transportation in their respective zones, including the road network, public transportation, bus and goods terminals, and networks of air, water, and roadways. The following chapter discusses land use, identifying land use patterns in both the master plan and the zonal development plan. The proposed land uses and percentages are compared to the current scenario (year 2015). There are also land use deviations for each land use - residential, commercial, public / semi-public, transportation, agriculture, and special area zones that are discussed. Furthermore, road widening proposals with proposed stretches were provided in all plans in accordance with the master plan provisions. The final chapter discusses land use-specific zoning regulations, as well as suggestive development guidelines for permissible and restricted usage. Each land use's detail deviation of each land use zone wise is discussed in the next chapter

11.8 DIRECTION OF FUTURE DEVELOPMENT

Due to the lack of availability of the land parcel for future development, the development shall be taken place in the three directions as described below:

- **Direction – 1: Minimum Expansion** – In the coming year's development will be happen towards Sahaspur and Doiwala along the major roads and transit axis. In this direction, the existing wards will be less densified compared to the first direction.
- **Direction – 2: Linear Development** – Each Urban Centre (Dehradun, Sahaspur, Doiwala, Rishikesh, and Haridwar) will function as an activity node with a specific focus. As a result of a good Public Transportation System, all activity nodes will be closely connected via a transport corridor. By following this path, green areas between the two centres and along the transit corridor will be preserved. Mainly road toward Rishikesh on eastern side and road towards paunta sahib has potential of future development.

Figure 7: Direction of Future Development



11.9 FUTURE LAND REQUIREMENTS (S)

As per Existing Land Use of Dehradun Planning Area, existing developed area is 125.70 sq.km while existing population of the Dehradun Planning Area is 948950 as per the census 2011 which results into the 75.49 PPH population density of the existing developed area. As per URDPFI Standards, permissible developed area densities for Large and Metropolitan Cities in plain areas are 125 – 175 PPH. So, considering 125 PPH, additional land requirement for the future population will be around 99.86 sq.km. For the developed area density of 150 PPH and 175 PPH, additional land requirement will be 83.22 sq.km and 71.33 sq.km. respectively. The detailed calculation for the future land requirement is described in the table given below:

Sr. No.	Description	Unit	No.
1	Existing Developed Area	sq.km.	125.70
2	Existing Population of Planning Area (Census 2011)	No.	948950.00
3	Developed Area Density	PPH	75.49
4	Permissible Developed Area Density for Large/ Metropolitan Cities	PPH	125 - 175
5	Proposed Residential Population for the Planning Area	No.	2197239.00
6	Additional Population Accommodate	No.	1248289.00
7	Considering 125 PPH, additional land requirement will be	Hectare	9986.31
9	Considering 150 PPH, additional land requirement will be	Hectare	8321.93
11	Considering 175 PPH, additional land requirement will be	Hectare	7133.08

Source: Consultant's Analysis

As per the Existing Land Use Plan, area available under vacant and wasteland which will be the potential sites for future development is not sufficient for the future requirement. Furthermore, the land pockets available under these uses are small and scarred in the region. So, the agriculture land shall be used for the future development in the region based on the land suitability analysis.

11.10 KEY ISSUE(S) AND POTENTIAL(S)

- Areas under industrial and recreational activities are less in comparison to URDPFI Norms.
- Dedicated Commercial zone is not sufficient in the region.
- Area available for the future development is not sufficient for the proposed population.
- Being a State Capital and Education Hub of Uttarakhand, around 31 percent of the total developed area is under the Public and Semi-Public Use.
- The existing roads are well inter-connected with the different localities of the core city. However, roads in the outskirts are not so well developed and sparsely distributed.
- A major chunk of land is under Green and Eco Sensitive areas that needs to be protected while development.
- Higher Residential densities, Existing Development Pattern, Low lying areas especially near to the rivers and vulnerability to the natural disaster are the major constrains of development in Dehradun planning area.

12 DEVIATION FROM PREVIOUS MASTER PLAN

12.1.1 Introduction

Population, Economic Development, Institutions, Technology and Culture are the significant reasons for land use deviation, according to worldwide environmental research study (Mather,2006). Political, Legal, Economic and Cultural issues influence land use deviation decisions (Lutzenberger et al.,2014).

The Uttarakhand High Court decided to put a stay on Dehradun Master Plan 2005-2025 in June 2018 because it lacked permission from the Union Ministry of Environment, Forests, and Climate Change. (Source: *Amar Ujala*, 15 June 2018) In this chapter the deviation is derived from Zonal Development Plan which are approved by concerned authority.

12.1.2 Deviation from previous Master Plan 2025

Deviation from the Master Plan exercise was carried out in order to comprehend the parameters of land allocation for the Master Plan 2025 and understand the zonal development land allocation strategies.

The proposed total area for planning area in Mater Plan 2025 is 35867.22 hac, which has increased to 37843.6 hac in 2021.As shown in table area is further divided into different land uses for the development purposes.

Table 12-1: Deviation from Master Plan 2025

Land uses	Master plan 2025 (In hac)	In %	ELU 2021 (In Hac)	In %
CLASSIFIED LAND USE				
Residential	5306.55	14.79	4739.5	12.52
Commercial	431	1.20	382.2	1.00
Industrial	281	0.78	95.8	0.25
Mixed Land Use			1639.7	4.33
Public Semi Public	3041.1	8.47	4068.7	10.75
Recreational	1007.89	2.81	137.8	0.36
Traffic and Transportation	1526.8	4.25	1648.3	4.35
Green Area	13539.77	37.74	12996.9	34.34
UNCLASSIFIED LAND USE				
Water Bodies	1183.81	3.300534583	1221.6	3.22
Agriculture	6416.50	17.89	6334.4	16.73
Defence Area	3132.8	8.73443774		
Vacant Land			3871.7	10.23
Waste Land			707	1.86
TOTAL	35867.22	100	37843.6	100

12.1.3 Land Use Evaluation of Previous master Plan 2025

In the master plan 2025, 14.79% of the total area is proposed for residential purposes, whereas in 2021, only 12.52% of the area is developed, and the remaining 2.27% diverted to another use. For commercial purpose only 1.01% of the 1.20% area has been developed thus, the remaining allocated land is converted into mixed land use along the city's major roads. As defined in the master plan 2025, 0.78% is allocated for manufacturing purposes, with the goal of maintaining ecological development with industrial growth in the city, out of which only 0.25% is developed as per the master plan, with the remaining land falling primarily under mixed land uses. According to the existing land use plan, the area is more under public semi-public use than the area allocated in Master Plan 2025, which is 8.11% in Master Plan 2025 and 10.70% in existing use.

A 0.37% area is proposed for public utilities, with only 0.05% developed in 2021 for water supply, solid waste, sewage, and sanitation schemes, among other things. As stated in the master plan 2025, the area allocated for transportation activities is 4.26%, and currently 4.36% of the area is under traffic and transportation services, indicating that the city has improved connectivity and services over the last decade. Only 0.36% of the 2.81% area is allocated for recreational activities, with the remaining land is diverted to other uses such as green space and mixed land use. Green area land use also meets the master plan 2025 target of 37.37% proposed for green area development, out of which 34.34% land is already developed in 2021. Water body area has decreased due to encroachment by slums along the water bodies; in Master plan 2025, 3.30% area is defined for water bodies, whereas in 2021, only 3.21% area is under water bodies, indicating a 0.09% loss of water body area. Agriculture area has also decreased from 17.89% to 16.74% as a result of rapid population growth and urbanisation and increase in built in the city.

12.1.4 Proposal Evaluation of Previous Master Plan 2025

As previously stated, the Supreme Court scrapped Master Plan 2025 due to environmental concerns, and their proposals are also not being implemented as a result of the stay. In 2019, Zonal Development Plans were prepared to regulate development in the city, and some of the proposals in those plans are taken from Master Plans under zonal plans and smart city proposals.

12.1.5 Deviations from Zonal Development Plans

According to notification no 907/Ni Anu/ZDP Letter/2020 issued under Uttarakhand Town and Country Planning Act section 10(2), the Zonal Development Plan will be effective on July 25, 2019. The total area proposed under various land uses is 359.72 hac, which has increased in the year 2021, according to the ELU 2021, the total area proposed under various land uses is 378.43 hac. Zonal Plans has been prepared based on the Revised Master Plan 2025.

Table 12-2: Deviation from Zonal Plans 2031

Land uses	Zonal plan 2025 (In hac)	In %	ELU 2021 (In Hac)	In %
CLASSIFIED LAND USE				
Residential	8254.14	22.95%	4739.5	12.52%
Commercial	609.99	1.70%	382.2	1.01%
Industrial	286.54	0.80%	95.8	0.25%
Mixed			1639.7	4.33%
Public/ semi public	6869.99	19.09%	4048.9	10.70%
Public utilities			19.8	0.05%
Transportation	1456.53	4.05%	1648.3	4.36%
Recreational	594.5	1.65%	137.8	0.36%

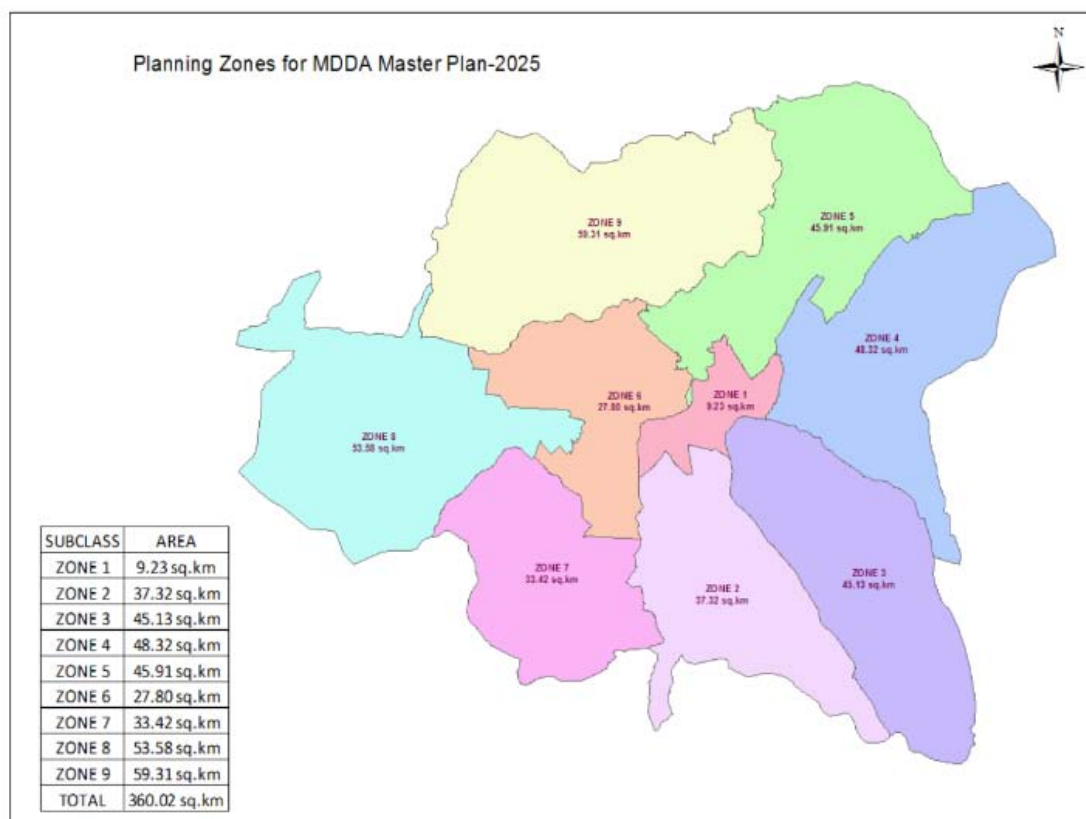
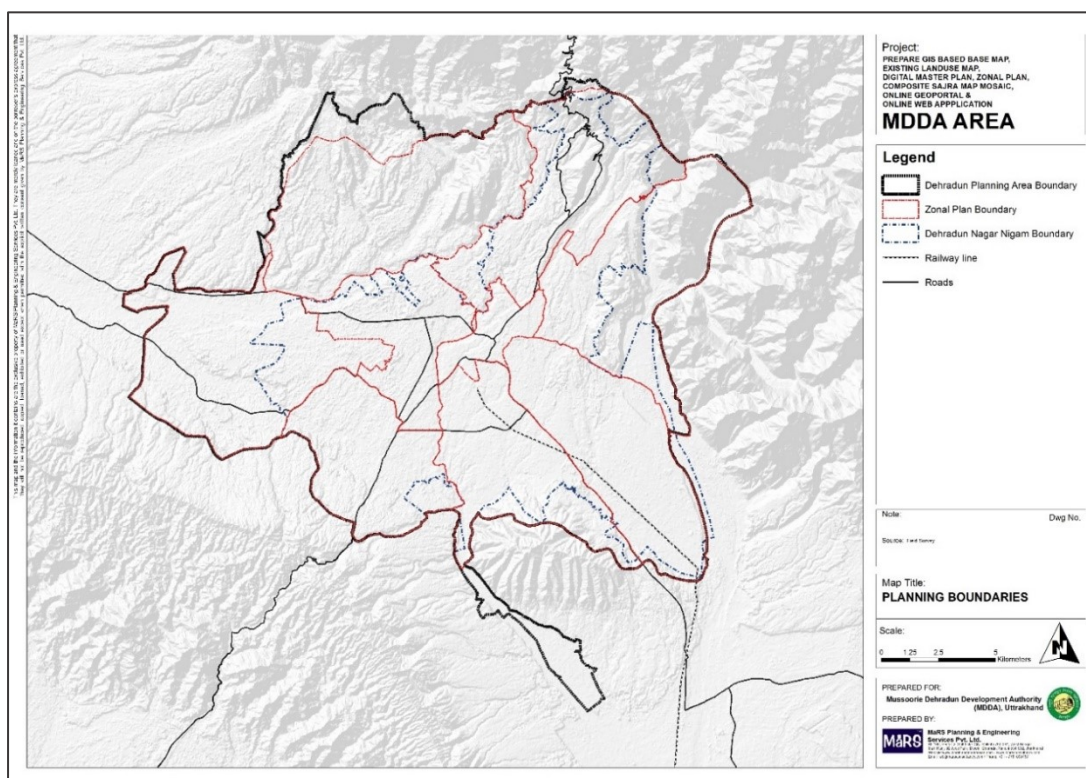
Land uses	Zonal plan 2025 (In hac)	In %	ELU 2021 (In Hac)	In %
Green Areas			12996.9	34.34%
UNCLASSIFIED LAND USE				
Water bodies			1221.6	3.23%
Agriculture	17900.94	49.76%	6334.4	16.74%
Defence area				
Vacant land			3871.7	10.23%
Waste land			707	1.87%
Total Area	35972.63	100%	37843.6	100%

S.N o	Land use Deviation	Deviated Area (In sq km)	Deviated Area (In Hac)	Total Deviated area	Deviation (in %)	Total Area Allocatio n
1	Residential Commercial to	1.413839 553	141.3839 553	4253.195 777	49.92864 133	8518.549
2	Residential to Industries	0.130894 739	13.08947 392			
3	Residential Recreational to	0.223181 262	22.31812 618			
4	Residential to Traffic and Transportation	4.86431	486.431			
5	Residential to Green Areas	3.855225 249	385.5225 249			
6	Residential to Specific Land use	0.068606 965	6.860696 492			
7	Residential Unclassified to	31.9759	3197.59			
9	Commercial to Industrial	0.04127	4.127			
10	Commercial Recreational to	0.02956	2.956			
11	Commercial to Traffic and Transportation	0.26005	26.005			
12	Commercial to Green Areas	0.07337	7.337			

S.No	Land use Deviation	Deviated Area (In sq km)	Deviated Area (In Hac)	Total Deviated area	Deviation (in %)	Total Area Allocation
13	Commercial to Unclassified land use	1.24701	124.701			
14	Industrial to Residential	0.27585	27.585	189.846	66.83946 434	284.0327 969
15	Industrial to Commercial	0.11975	11.975			
16	Industrial and Traffic and Transportation	0.15058	15.058			
17	Industrial to Green Areas	0.0165	1.65			
18	Industrial to Unclassified land use	1.33578	133.578			
19	Public Semi Public to Residential use	1.34013	134.013	1032.736 639	41.88446 197	2465.679 611
20	Public semi public to commercial use	0.19702	19.702			
21	Public semi public to Industrial land use	0.00823	0.823			
22	Public semi public to Recreational	0.16399	16.399			
23	Public Semi Public to Traffic and Transportation land use	0.85845	85.845			
24	Public Semi Public to Green Areas	2.0861	208.61			
25	Public Semi Public to Specific land use	0.009246 389	0.924638 877			
26	Public Semi Public to Unclassified use	5.6642	566.42			
27	Recreation to Residential	0.619125 434	61.91254 343	363.9975 143	69.76179 524	521.772
28	Recreation to Commercial	0.033301 197	3.330119 698			
29	Recreation to Mixed land use	0.172799 781	17.27997 815			
30	Recreational to Industrial	0.016761 463	1.676146 259			

S.N o	Land use Deviation	Deviated Area (In sq km)	Deviated Area (In Hac)	Total Deviated area	Deviation (in %)	Total Area Allocatio n
31	Recreation to Traffic and Transportation	0.180313 267	18.03132 673			
32	Recreation to Unclassified	2.617674	261.7674			
33	Special area to Residential	2.443371 266	244.3371 266	3151.454 333	73.67190 718	4277.688
34	Special area to Commercial	0.143106 205	14.31062 045			
35	Special Area to Mixed Land use	1.195608 558	119.5608 558			
36	Special area to Industrial	0.050537 457	5.053745 728			
37	Special area to Public Semi Public	20.76742 544	2076.742 544			
38	Special area to Recreational	0.375169 593	37.51695 927			
39	Special area to Traffic and Transportation	1.486893 131	148.6893 131			
40	Special Area to Unclassified land use	5.052431 681	505.2431 681			
41	Traffic an Transportation to Residential	2.187003 308	218.7003 308	901.7255 083	52.36513 374	1721.996
42	Traffic and Transportation to Commercial	0.551819 978	55.18199 782			
44	Traffic and Transportation to Industrial	0.042753 25	4.275325 024			
45	Traffic and Transportation to Recreational	0.044615 907	4.461590 697			
46	Traffic and Transportation to Specific Land Use	0.288139 94	28.81399 396			
47	Traffic and Transportation to Unclassified land use	5.902922 7	590.2922 7			

Figure 12-1 Master Plan and Zonal Plan boundary



12.1.6 Land use Evaluation of Zonal Development Plans

In all Zones the area designated for Residential is 22.95% out of which 12.52% is developed so far. For commercial purpose 1.70% area is proposed out of which till present only 1.01% is developed. For industrial purposes 0.80% area is allocated out of which 0.25 is developed in

kuawala, Mohebewala industrial zones. There is no provision given for mixed land use in zonal development plans, it was mentioned that mixed uses area shall be done by the local body in accordance with the Mixed Land Use Regulations. Mixed use would be permitted on streets/stretches that have already been notified to the appropriate authorities. Local area plans will depict the mixed-use areas, 4.33% area is under mixed land use in the current year under sun categories such as residential commercial mixed land use, Residential Education mixed land use and Residential Health Services and Residential Household Industries. For Public Semi-public, 19.09% area is allocated out of which only 10.70% area is developed for education, health, tourism and religious and utility purposes.

Transportation development is taking place in accordance with the proposals; in the Zonal Development Plan, 4.05% of the area is allocated for transportation services, and in the current year, the area is more developed than the allocated 4.36% of the total zonal development planning area. As the city has tourism activities and many educational institutions, there is a need for a greater number of playgrounds and parks. 1.65% of the area has been allocated for recreational activities, of which 0.36% has been developed so far. In ELU 2021, there are various land uses such as agriculture land, vacant land, and waste land. In the preparation of the ELU 2021 Amrut guidelines, the defence area has been merged under public semi-public land use.

12.1.7 Proposal Evaluation of Previous Zonal Development Plan

The major proposals in the zonal plan include a new and updated road network, changes to parcel land use, and changes to land parcel boundaries. There are changes in given Master Plan 2025 proposals in all zones, such as transportation proposals, where some Master Plan 2025 proposed roads are removed and others are added with updated ROW.

In zone 1, 18m master plan proposed road is updated with 9m Row in ZDP, and some land use boundaries are also changing such as commercial land use and Public -Semi Public land use. In Zone 2, proposed 24-meter road was removed and alternatively the same road was proposed with 9m ROW and 50m road was deleted and some of the areas are converted from residential to public- semi-public and traffic transportation. In zone 3, change in alignment of roads of 24m to 12m and 18m.and some land uses are deviated from commercial to public- semi-public, residential to public semi-public and residential to commercial. In Zone 4 ,18m proposed roads are realign with 9m RoW and agriculture land parcels are converted into public semi-public purposes for the future population requirement.

In Zone 5, proposed 18m road is deleted in zonal development plan and some land parcels boundaries are also changed, and commercial areas are converted into residential commercial mixed land uses. The major proposals in Zone 6 are Proposed 24m road is realigned with 12m.as the residential areas are impacted by proposed 24 m roads. In Zone 7, 50m proposed roads are deleted, and, 18m roads new road is proposed in zonal plan. Public and semi-public land parcel is converted into residential. Zone 9, the main proposals are change in the total area of public and semi-public, public and semi-public land parcel is converted into residential and Agriculture parcel is converted into public and semi-public use for the future requirements

12.1.8 Proposed Land Use Comparison – Zonal Plans 2031 and Master Plan 2025

Zonal Plans 2031 has been prepared based on the Revised Master Plan 2025. However, a lot of mismatched has been observed in each land use. The details have been covered in the table given below. The major variation is observed in both the plans is under Residential Use and Special Areas. However, in both the plans, areas under mixed use development is not separately calculated.

Table 12-3: Proposed Land Use Comparison - Zonal Plans 2031 and Master Plan 2025

S.No.	Land Use	Total Area as per the Proposed Land Use of Zonal Plans	Proposed Land Use of Master Plan 2025
1	Residential	82.54	53.06

S.No.	Land Use	Total Area as per the Proposed Land Use of Zonal Plans	Proposed Land Use of Master Plan 2025
2	Commercial	6.09	4.31
3	Mixed Use	0.00	0.00
4	Industrial	2.86	2.81
5	Public and Semi Public	25.81	24.70
6	Recreational	5.94	11.67
7	Transportation	14.56	15.26
8	Agriculture	179.00	0.00
9	Special Areas	42.88	1.83
10	Other Uses	0.00	247.39
Total		359.7	361.03

Source: Master Plan 2025 and Zonal Plans 2031

13 VISION 2041 AND STRATEGIES FORMULATION

13.1 VISION FORMULATION

Dehradun's development is to ensure high quality built and natural environments, sustainable and equitable infrastructure development, and to improve the town's quality of life and imageability through optimal use of existing developable land and incentivize redevelopment of old structures.

13.1.1 Aim and Objective of Master Plan

The Master Plan aims to ensure the Planned, Sustainable and Equitable Development of the Dehradun. The following are the objectives prepared for Master plan 2040 of Dehradun city-

- 1) To regulate the development in Dehradun and ensure the planned development of the city based on the master plan and zoning regulations.
- 2) To protect and enhance the environmental quality through the preservation of forest areas, protection of river flood zone, protection of natural drainage system of the town, preservation and renovation of water bodies.
- 3) Create a network of green and blue infrastructure in the city to improve the quality of build environment and live in harmony with nature.
- 4) Ensure optimal utilisation of Transit-oriented development along the mass transit system (MRTS) of present and any upcoming MRTS in future.
- 5) The master plan will ensure the optimisation of the residential and commercial areas of the city through proper zoning regulation.
- 6) Dehradun has many floating populations like students and tourists who visit or stay in the city for a few days to a few months for education, medical health care and jobs. Hence rental housing will be incentivised in the planning and development control guidelines.
- 7) To ensure proper housing for all people, group housing for EWS and LIG will be incentivised in government and private housing.
- 8) To ensure proper facilities and services for the tourism sector as that is the backbone of the economy of Uttarakhand.

13.1.2 State Vision

Transform the Uttarakhand economy into a prosperous, healthy state such that the people are educated and gainfully employed in an equitable society, synergy between the environment and the inhabitants is enhanced, and the development process is sustainable and inclusive.

The Vision for Uttarakhand outlines the vision for the SDGs and the targets/indicators as applicable for the state for the coming years till 2030. It indicates the strategy to achieve the same. A set of indicators suitable for the state have been developed for the targets under the individual SDGs, which can be monitored over time. The Vision for Uttarakhand State Government was framed with the background of 17 Sustainable Development Goals. The framework is focused on the people for the development process. SDGs are categorised into four groups, each of which contributes towards enhancing the development process for the people of Uttarakhand.

The four categories are:

1. Sustainable Livelihoods,
3. Social Development and
4. Environmental Sustainability (refer to Error! Reference source not found.).

The Vision 2030 for the state, keeping in mind the implementation of the SDGs, is the following: "Transform the Uttarakhand economy into a prosperous, healthy state such that the people are educated and gainfully employed in an equitable society, synergy between the environment and the inhabitants is enhanced, and the development process is sustainable and inclusive." The vision centres on the creation of sustainable livelihoods for the people of the state and also to enhance the human and social development in a sustainable manner which would conserve natural resources and protects the environment, such that no-one is left behind

13.2 STAKEHOLDER CONSULTATION OUTCOME

During the course of the master plan preparation for Dehradun, three stakeholders' consultations have been conducted and based on the discussions and suggestions given by different stakeholders, many issues and proposals have been interpreted. Out of three meetings, two were CERC meetings involving Dehradun Nagar Nigam, MDDA, Smart City Department, Public Works Department, National Highway Authority of India and Town Planning Department of Dehradun. The meetings led to suggestions for proposed and existing land uses. The significant proposals suggested revolved around sustainable tourism, the ecological balance of development and the environment, especially in education and medicine.



Figure 13-1 CERC Stakeholders Meeting at Dehradun on 12th September 2022

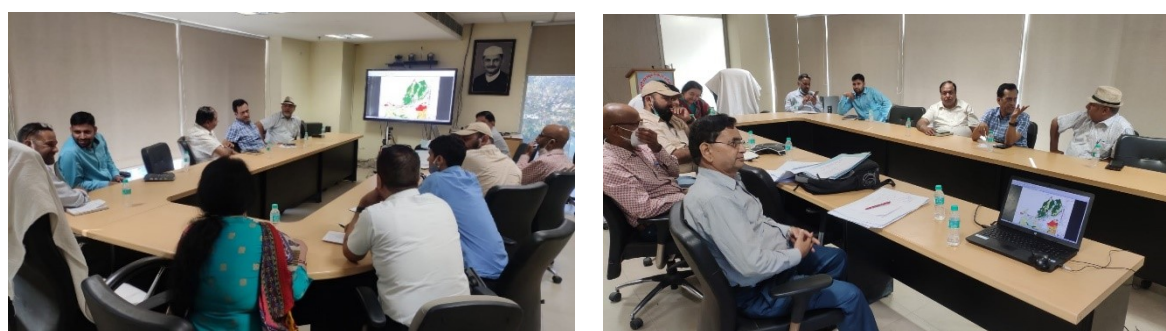


Figure 13-2 Stakeholder Meeting at Dehradun held on 18th April 2022

13.3 SWOT ANALYSIS

STRENGTHS	WEAKNESS
<ul style="list-style-type: none"> Being the gateway of the State and capital city, Dehradun has good connectivity with all-weather roads to other states and cities. City is one of the most famous tourist attractions creating a heavy inflow of all-season tourists leading to revenue generation and employment opportunities. Dehradun is one of the prominent educational hubs with major institutes which attracts students from other states. Dehradun literacy rate is higher than the average literacy rate in India hence, more technical advancement strategies can be proposed. Dehradun city is rich with natural resources like rivers, forests, green areas and foothills of the Himalayas, creating an aesthetic and pleasing environment for tourists and citizens. The city has an excellent natural drainage network, which ensures the city is never flooded hence creating lesser disruptions during monsoon. 	<ul style="list-style-type: none"> Dehradun planning area has the Himalayas to its north, creating geographical barriers for further expansion or development. Infrastructure facilities, including water supply, solid waste management, sewerage and sanitation, are insufficient for the whole city. Slums encroachment near the river basins disturbing the water ecology of the city. These encroachments create social issues for the slum population as well as for using river water which is not up to the desired Ph level There is a shortage of housing for the existing population as well as students who migrated for educational purposes; The family size of Dehradun housing is 4.5, whereas the average housing size should be 4. There are insufficient public transport facilities in the city, leading to more private vehicle usage, affecting the environment. There is a lack of parking spaces for residents and tourists, and this causes traffic jams during peak seasons and increases accidents.
OPPORTUNITIES	THREATS
<ul style="list-style-type: none"> City has a good environment due to its closure to mountains which can be a good asset for future development activities like the creation of cycle and walking pathways. There is a scope for education and medical tourism for economic enhancement. And revenue generation. The city has very low-density urban development, and this can be optimised using the TOD-based development City has planned commercial and mixed land use areas leading to the potential for MRTS with the concept of Transit Oriented Development. Potential of TOD implementation will lead to the promotion of public transport as well as non-motorised vehicles. This will also create a healthy socio-economic environment among the users, including 	<ul style="list-style-type: none"> There is a threat to the ecological balance in the town causing pollution, reducing green and open areas, traffic issues etc due to the city expansion in an unplanned manner. The core area of the planning area has lesser green spaces and open areas creating environmental and social issues for the public. Presence of slum pockets near river bodies causes environmental issues like soil erosion and water degradation because of open defecation or cleaning activities. The usage of river water by the slum population affects health due to water quality not being up to the average Ph level. To overcome these issues buffer has to be created among the river basin, and provision for basic infrastructure is required for the slums. The natural drainage is being disturbed by the unplanned development in some areas.

<p>cheaper means of transportation, safety, a sense of inclusion etc.</p> <ul style="list-style-type: none"> • Natural drainage in the city due to the topography provides an opportunity to trap water and create a successful storm waste management system. The process will also help to cover the demand-supply gap in future population • Dehradun city has a good number of famous temples and has the potential to invite religious tourists all across the world. • With the growing tourism potential, the city also has the potential to start intra-city buses, especially for tourism activities. • Dehradun already has mixed land use development in the core areas; future planned mixed land use will help to reduce pressure on the planning area. • Dehradun city has forest and agricultural activities which can create opportunities for forest-based and food processing industries. 	<ul style="list-style-type: none"> • Economic activities are located in some particular areas, increasing the travel time of residents. • The city core area has mixed land use, causing congestion issues like on-street parking on footpaths, traffic, and lack of pedestrian infrastructure. • There are no cycle tracks or any other activities related to walking, forcing the public to through motorised vehicles, which causes pollution as well as increases the chances of vehicular pedestrian conflicts. <p>16.</p>
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13.4 SUSTAINABLE APPROACH FOR PLANNING AREA POPULATION AND HOUSING

There is an uneven population distribution, with high population density in the core areas and low population density in the peripheral area of Dehradun. Besides, migration control is necessary as the housing supply does not cover the demand leading to slum encroachments near river basins. To solve these issues, there should be a provision for land-based subsidised housing under the PPP model, in which the private developer can design, build, operate and finance the model and then transfer it to the public authority over a period of time. The second model can be Mixed Development Cross-subsidized Housing. In this, the private developer could use the entire land made available by the government for high-end housing in exchange for providing affordable housing at another location, on the ground arranged by the private developer, as long as the other land's characteristics are similar to those offered by the State

13.5 URBAN REVITALIZATION

The core area of Dehradun is congested due to encroachments of shops and vehicles on the streets. Hence it is vital to retain and conserve the core area without altering existing physical structures. Improvement in the regulation of motorised vehicles and introducing better pavements for pedestrian safety should be proposed. Furthermore, cycling and walking should be promoted to reduce pollution and congestion. There can be also a provision of street furniture and lighting near heritage characters for its preservation and promotion. Moreover, sector-specific technologies and policies need to be taken for pollution control in the core areas

13.6 ECOLOGICAL BALANCE

It is necessary to restore the ecological balance of the entire area. Doon Valley while addressing the community's demand to preserve the natural ecosystem. Provision for built-up areas should be balanced with green regions (especially in the core area) for pollution and congestion management. Wildlife sanctuaries, wetlands, riverfronts, slopes, mountains and

forest areas should be conserved, as being an eco-sensitive zone, preserving all-natural features and landforms is essential. Proper buffer areas should be maintained, especially near river basins, to avoid soil erosion and other issues

13.7 ENHANCING THE “IMAGE” OF PLANNING AREA

As Dehradun has an image of green areas on the foothills of mountains with rich landmarks and history. It is essential to focus on tourism activities with environmental protection and propose sites that provide a sense of place or history. Furthermore, the roads and construction should be done in such a way that it does not hamper the scenic view of the mountains and should be built within the façade of existing landmarks.

13.8 CONCEPTUAL PLAN

Conceptual planning models are theories based upon assumptions and principles to plan a city/area/space keeping environmental and socio-economical context in mind, it helps in defining land use, building better infrastructure accessibility, and developing amenities. Although no two cities are similar, the models can be updated as per the requirement or character of the particular area for best strategies and developments.

13.9 ALTERNATIVE CONCEPTS

Different concepts of sector models have been discussed in the context of the Dehradun Planning Area. These concepts explain the spatial arrangement and settlement patterns and their relationship.

13.9.1 Concept Alternative 1- Concentric Zone Model

The concentric zone model is the Burgess model, implying that each zone is not static. The model is divided into zones where the outermost zone is Upper class and middle-class residential, then lower-class residential zones and a transition zone towards Central Business District. The transition zone forces low-income groups to move outwards. This group, then, displaces the middle class and the wealthy, that, in turn, are forced to move outwards.

13.9.2 Concept Alternative2- Multi Nuclei Model

This model implies that the city has multiple growth points referred to as nuclei. The city might start with the central business district, but with time the activities are scattered and modified, where each dominant activity is formed as a nucleus.

13.9.3 Concept Alternative 3- Sector Model

The sector model implies that the cities grew and activities arranged themselves in the form of a sector radiating out from the main central district. Cities in this model do not develop as simple rings but develop various sectors. These sectors generally grow along the railway lines, highways or rivers. The Model includes the Central Business District (CBD), Factories and industries, low-class residential, middle-class residential and high-class residential.

13.9.4 Concept Alternative 4- Compact City Model

The compact city Model is a sustainable approach model which emphasises bringing urban activities closure together for efficient utilities and services via public transportation, walking and NMT vehicles. It promotes high density with predominantly mixed land use and provides infrastructure within walkable distances. It focuses on all activities to be concentrated within one place compactly to achieve environmental, economic and social sustainability.

13.10 SPATIAL STRATEGIES FOR SELECTED CONCEPTS

After implying all four models in the Dehradun Planning Area, Multi Nuclei Model suits the city most. The primary reason is that industrial and public/ semi-public sectors development followed

by residential areas along the transport corridors like Multi Nuclei Concept Model. Additionally, the proposed concept does not deviate from the Zonal plan completely and is conformed to the direction of development envisioned in the exiting Zonal Plan.

13.11 APPROACH FOR DEVELOPMENT

Major spatial proposals will be related to the selected concept model and Dehradun Planning Area. Proposal for better transportation infrastructure including road widening, by-pass roads, improvement of public transportation, provision of walking and cycling tracks, especially in congested areas. The following proposal is the protection of the natural drainage pattern of Dehradun through the rectification of encroachments in eco-sensitive areas. Also, a buffer should be provided on both sides of natural drains. These buffer zones can be an opportunity for creating recreational zones for tourist activities. Proposal for mixed-use zones with industries and commercial along the NH 307 and NH-7.

14 PROPOSED LAND USE 2041

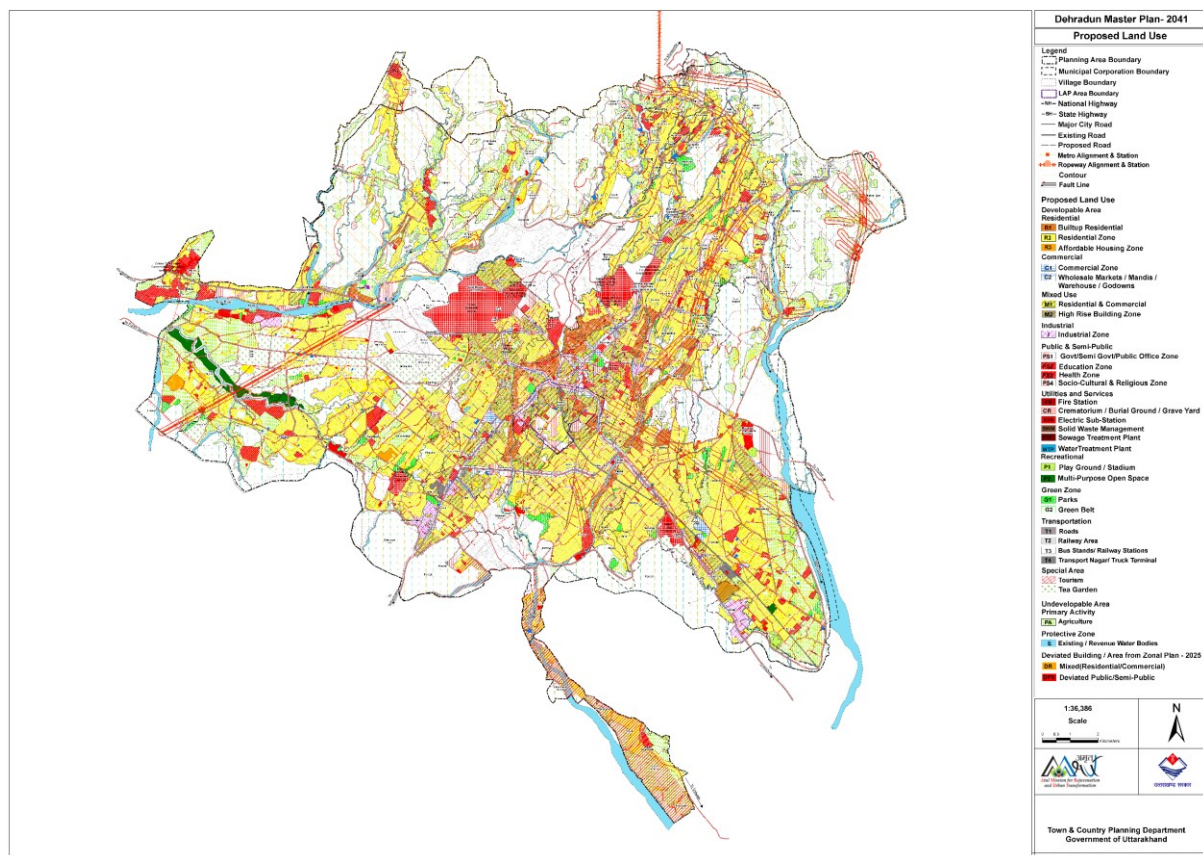
14.1 GENERAL INTRODUCTION

After the detail study of Dehradun Existing Landuse and calculating future requirements, the proposed Land Use map is prepared. The proposed Land Use is prepared based upon various detailed land suitability analysis and various surveys. Apart from detailed studies and analysis, Stakeholder discussions were also a major part of Dehradun Proposed Land Use. The Proposed Land Use map is prepared as per the guidelines of AMRUT and the major Land Use categories are adopted from URDPFI Guidelines, 2014.

14.2 PROPOSED LAND USE

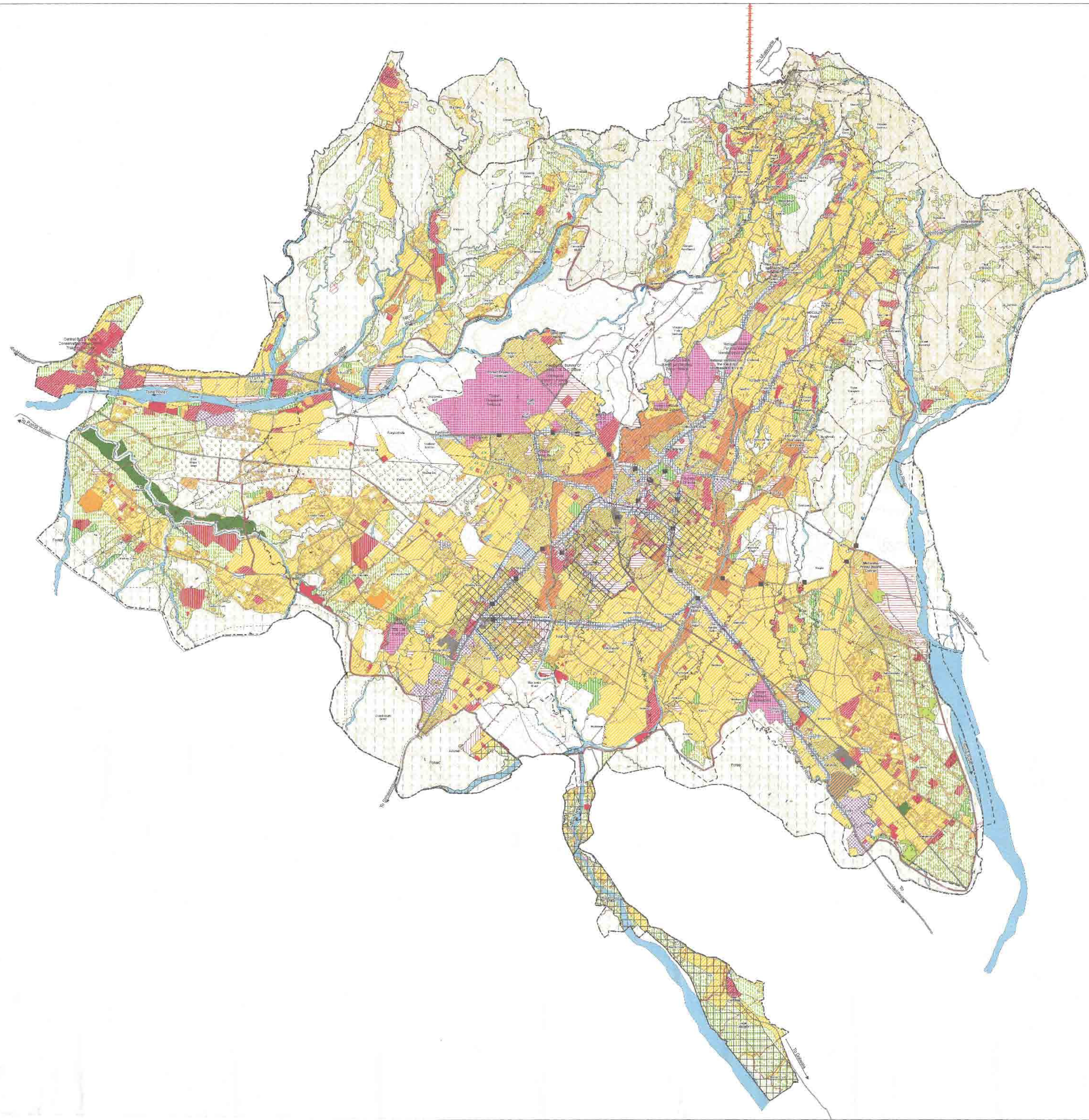
The Dehradun Masterplan Area is 248.69 Sq Km Divided into two broad categories i.e., Developed Area 179.16 Sq Km and Undeveloped Area is 69.52 Sq Km. Addition to this, forest area around Dehradun Accounts for 98.72 Sq km and Cantonment area accounts for 30.59 Sq Km, making the total area of 378 Sq Km. Developable Area accounts 72% containing for the proposals for the future requirements of the total Dehradun Planning Area 2041. The Undeveloped area comprises Agriculture land, Special Area Zone, and Protected Zone. The impact of development in the developable area on the environment can be balanced by undeveloped areas.

Figure 14-1 Proposed Land Use Map of Dehradun for the year 2041



14.3 LAND USE DISTRIBUTION

The total future Land Use of Dehradun Planning Area is proposed as per the URDPFI guidelines and existing on ground analysis. Out of the total Dehradun Planning Area, 58.63% is allocated to



Dehradun Master Plan- 2041

Proposed Land Use

Legend

- Planning Area Boundary
- Municipal Corporation Boundary
- Village Boundary
- LAP Area Boundary
- NH- National Highway
- SH- State Highway
- Major City Road
- Existing Road
- Proposed Road
- Metro Alignment & Station
- Ropeway Alignment & Station
- Contour
- Fault Line

Proposed Land Use

Developable Area

Residential

- R1 Builtup Residential
- R2 Residential Zone
- R3 Affordable Housing Zone

Commercial

- C1 Commercial Zone
- C2 Wholesale Markets/ Mandis/ Warehouse/ Godowns

Mixed Use

- M1 Residential & Commercial
- M2 High Rise Building Zone
- M3 TOD Zone

Industrial

- I1 Industrial Zone

Public & Semi-Public

- PS1 Govt/Semi Govt/Public Office Zone
- PS2 Education Zone
- PS3 Health Zone
- PS4 Socio-Cultural & Religious Zone

Utilities and Services

- U1 Fire Station
- CR Crematorium/ Burial Ground/ Grave Yard
- ES Electric Sub-Station
- SW Solid Waste Management
- STP Sewage Treatment Plant
- WT Water Treatment Plant

Recreational

- P4 Play Ground/ Stadium
- P5 Multi-Purpose Open Space

Green Zone

- G1 Parks
- G2 Green Belt

Transportation

- T1 Roads
- T2 Railway Area
- T3 Bus Stands/ Railway Stations
- T4 Transport Nagar/ Truck Terminal

Special Area

- SA1 Tourism
- SA2 Tea Garden
- SA3 Central Govt Institute/ Office Areas

Undevelopable Area

Primary Activity

- PA1 Agriculture

Protective Zone

- E1 Existing / Revenue Water Bodies
- E2 Eco Sensitive Zone

Deviated Building/ Area from Zonal Plan

- DR Mixed(Residential/Commercial)
- DPS Deviated Public/Semi-Public

1:35,000

Scale

0 0.5 1 2 Kilometers



Atal Mission for Rejuvenation and Urban Transformation

Town & Country Planning Department
Government of Uttarakhand

Consultant: MaRS Planning & Engineering Services Pvt. Ltd.

residential land use and 9.37% is allocated to Commercial Land use. Both the land uses are slightly lower than the URDPFI Guidelines due to the additional provision on mixed land Use comprising residential as well as the commercial use. With this addition, the balance to cover the desired percentage is covered. Further the Public Semi-Public Accounts for 9.45% of the total planning area which is higher than the URDPFI guidelines. The major reason behind is Dehradun being the State capital consists many government offices and institutions. Further, Dehradun transportation accounts for 11.19% of the total proposed area including existing as well as additional land required for proposed road network. Recreational area is proposed 6.00% as per URDPFI Standards comprising parks, green belts, playgrounds, multipurpose parks etc.

The Land Use distribution of Dehradun Planning area for the year 2041 is given on the table 14-1.

Table 14-1 List of Developable Area, Proposed Land Use

Land Use	Proposed In New Masterplan	Deviated From Previous Masterplan	Total	Share	Standard	Remarks
-1	-2	-3	(2 + 3)	%	(AS PER URDPFI)	
Residential	9591.13	877.96	10469.09	58.43%	36-39	
Mixed	1587.62	84.62	1672.24	9.33%		
Commercial	697.56	68.86	766.42	4.28%	5-6	
Industrial	188.48	3.86	192.34	1.07%	7-8	
Public and Semi Public	1580.56	106.79	1687.35	9.42%	10-12	
Recreation	1071.25	-	1071.25	5.98%	14-16	
Transportation	1997.30	-	1997.30	11.15%	12-14	
Tourism	60.85	-	60.85	0.34%		
Total Developable Area	16774.75	1142.09	17916.85	100.00		

Table 14-1 Proposed Land Use Distribution

DEVELOPABLE AREA					
Level I			Level II		
Code	Use Category	Area (Ha)	Code	Use Zone	Area (Ha)
R	Residential	9591.13	R1	Built up Residential	496.28
			R2	Residential Zone	9052.26

			R3	Affordable Housing Zone	42.59
C	Commercial	697.56	C1	Commercial Zone	647.60
			C2	Wholesale Markets/ Mandis / Warehouse/ Godowns	49.56
M	Mixed Use	1587.62	M1	Residential & Commercial	1554.71
			M2	High Rise Building Zone	32.91
I	Industry	188.48	I	Industrial	188.48
PS	Public/ Semi-Public	1473.35	PS1	Govt/ Semi Govt/ Public Office Use Zone	686.61
			PS2	Educational Zone	669.52
			PS3	Health Zone	40.90
			PS4	Socio- Cultural and Religious Zone	76.32
U	Utilities and Services	107.21	US	Utilities Other	67.49
			FS	Fire Station	0.70
			CR	Cremation and Burial Ground/ Graveyard	19.41
			ESS	Electric Sub- Station	7.28
			STP	Sewage Treatment Plant	0.66
			SWM	Solid Waste Management	7.63
			WTP	Water Treatment Plant	4.03
G	Green Zone	834.01	G1	Parks	448.88
			G2	Green Belt Along Natural Drain	385.13
P	Recreational	237.24	P1	Playgrounds	88.65
			P2	Multi-Purpose Open Space	148.59
T	Transportation	1997.30	T1	Roads	1906.30
			T2	Railway Area	35.63

			T3	Bus Stand/ Railway Station/Truck Terminal	5.38
			T4	Transportation & Communication	49.98
S	Special Area	60.85	SAT	Tourism	60.85
	Transit Oriented Development			Transit Oriented Development Zone*	931.66*
				Local Area Plan Zone*	415.08*
DLU	Deviated Land Use		DR	Deviated Mixed	1035.30
		1142.09	DPS	Deviated Public and Semi- Public	106.79
Total Developable Area		17916.85			

*Note- The Transit Oriented Development (TOD) zone and Local Area Plan (LAP) zone is a controlled areas and not counted towards computation of total developed area to avoid any replication. The area of the landuses below these controlled areas have already been accounted in respective landuse category.

UNDEVELOPABLE AREA

Level I			Level II		
Code	Use Category	Area (Ha)	Code	Use Zone	Area (Ha)
P	Primary Activity	3801.38	PA	Agriculture	3801.38
S	Special Area	4755.77	SATG	Tea Garden	928.01
			SACI	Central Govt Institute / Office Areas	741.59
			SAIT	IT Park	27.04
E	Protective Zone	11326.59	E1	Water Bodies	1454.19
			E2	Eco Sensitive Zone*	785.22*
Total Undevelopable Area		6952.21			

*Note- The Eco sensitive zone area is a controlled area and not counted towards computation of total undeveloped area to avoid any replication. The area of the landuse below this controlled area have already been accounted in respective landuse category.

14.3.1 Residential

The total Residential Landuse in Dehradun Planning Area is 10469.09 Ha which accounts for 58.43%. Dehradun Planning Area comprises different types of Residential Landuse i.e., R1: Residential Zone, R2: Residential zone, R3-Affordable Housing, DLU Deviated Residential

Table 14-2 Residential Landuse Code Wise Distribution

CODE	USE ZONE	AREA (Ha)
R1	Built up Residential	496.28
R2	Residential Zone	9052.26
R3	Affordable Housing Zone	42.59
DLU	Deviated Residential	877.96

14.3.2 Commercial

The total commercial Landuse in Dehradun Planning Area is 766.42 Ha which accounts for 4.28%. The Masterplan composed of three types of Commercial Use Zone as per the future population requirements. The Four zones are, C2: Commercial Zone, and DLU: Deviated Commercial Zone.

Table 14-3 Commercial Landuse Code Wise Distribution

CODE	USE ZONE	AREA (Ha)
C1	Commercial Zone	647.60
C2	Wholesale Markets/ Mandis / Warehouse/ Godowns	49.56
DLU	Deviated Commercial	68.86

14.3.3 Mixed Use

Dehradun Masterplan Mixed Landuse accounts for 1672.25 Ha i.e. 9.33% of the total area. The use is divided into three zones- M1: Mixed Use (Residential and Commercial), M1: High Rise Building Zone and DLU Deviated Mixed Landuse.

Table 14-4 Mixed Landuse Code Wise Distribution

CODE	USE ZONE	AREA (Ha)
M1	Mixed Use (Residential and Commercial)	1554.71
M2	High Rise Building Zones	32.91

DLU	Deviated Mixed Land Use	84.62
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14.3.4 Industrial

The total proposed area under industrial Landuse is 192.34 Ha i.e. 1.07% of total proposed planning area. The assigned landuse is comparatively less than the URDPFI guidelines due to the existance of SIDCUL industrial area available in vicinity (Selaqui Industrial Area) of the planning boundary. The use is divided into two zones- I- Industrial, DLU- Deviated Industrial Landuse

Table 14-5 Industrial Landuse Code Wise Distribution

CODE	USE ZONE	AREA (Ha)
I	Industrial	188.48
DLU	Deviated Industrial Landuse	3.86

14.3.5 Public and Semi-Public

Public and Semi Public Landuse accounts for 1687.35 Ha i.e., 9.42% of the total Dehradun Planning Area. The landuse includes infrastructure facilities including Education, health care, open spaces, multipurpose grounds, sports facilities, Socio cultural and Religious, fire and disaster, telephone, postal and banking services to cater the social and physical infrastructure needs of the public. The Public/ Semi Public area governed by Central Government has been marked separately and not added to the computation of total area of Public/ Semi Public Landuse

Table 14-6 Public/ Semi-Public Landuse Code Wise Distribution

CODE	USE ZONE	AREA(Ha)
PS1	Govt/ Semi Govt/ Public Office Use Zone	686.61
PS2	Educational and Health Zone	669.52
PS3	Socio- Cultural and Religious Zone	76.32
US	Utilities Other	67.49
FS	Fire Station	0.70
CR	Cremation and Burial Ground/ Graveyard	19.41
ESS	Electric Sub- Station	7.28
STP	Sewage Treatment Plant	0.66
SWM	Solid Waste Management	7.63
WTP	Water Treatment Plant	4.03
DLU	Deviated PSP Landuse	106.79
	TOTAL	1687.35

14.3.6 Recreational

Dehradun Planning Area comprises 1071.25 Ha of Recreational landuse which accounts for 5.98 % of the total area percentage. The recreational zone has been divided into further five zones – G1: Parks, G2: Green Buffer along Natural Drains, P1: Playgrounds, P2: Multipurpose Open Space, parks and green belt along natural drain.

Table 14-7 Recreational Landuse Code Wise Distribution

CODE	USE ZONE	AREA (Ha)
P1	Playgrounds	88.65
P2	Multi-Purpose Open Space	148.59
G1	Parks	448.88
G2	Green Belt Along Natural Drain	385.13
TOTAL		1071.25

14.3.7 Transportation

Dehradun being the capital city, has a very good connectivity with other states and cities. Therefore, transportation sector is one of the major landuse to connect the inter as well as intra city population efficiently. Dehradun Planning Area accounts for 1997.30 Ha i.e., 11.15% of the total. The landuse comprises four zones- T1: Roads, T2: Railway Area, T3: Bus Stand/ Railway Station, T4: Transportation and Communication.

Table 14-8 Transportation Landuse Code Wise Distribution

CODE	USE ZONE	AREA
T1	Roads	1906.30
T2	Railway Area	35.63
T3	Bus Stand/ Railway Station/Truck Terminal	5.38
T4	Transportation & Communication	49.98
TOTAL		1997.30

14.3.8 Primary Activity (Agriculture Area)

Dehradun Planning Area comprises of 3801.38 Ha. Agriculture Landuse includes all the primary activities which are related to natural materials and man-made environment.

14.3.9 Special Area

Dehradun Special area comprises of 4755.77 Ha which is classified into two zones- Tourism, Tea Garden and Central govt Institute/ Office Areas.

Table 14-9 Special Area Landuse Code Wise Distribution

CODE	USE ZONE	AREA
SATG	Tea Garden	928.01
SACI	Central Govt Institute / Office Areas	741.59
SAIT	IT Park	27.04

14.3.10 Protective Zone

Dehradun falls in the valley of Himalayas therefore has many protective zones like water bodies, forest areas, The planning area lies around Rajaji National Park. Hence, it is important to protect these areas by keeping these areas in undevelopable Landuse. The protective zone comprises of two zones- E1: Water Bodies, E2- Eco sensitive zone (Rajaji National Park- No development Zone)

Table 14-10 Protective Zone Landuse Code Wise Distribution

E1	Water Bodies	1454.19
E2	Eco Sensitive Zone* (Rajaji National Park- No development Zone)	785.22*

14.4 SHORT TERM – PROJECTS BASED ON TIMELINE

Short- term projects are proposed to solve the urgent needs identified within the Dehradun planning area. The proposals identified are given below-

14.4.1 Inclusion of Dedicated Green Spaces

Dedicated Green spaces such as parks, community gardens, play grounds, urban forests in urban and peri urban areas in cities mitigate the effects of pollution and can reduce a phenomenon known as the urban heat island effect, which ultimately enhance the quality of life of its residents.

At present, Dedicated Green Space is only 1.38 sq.km which is only around 1% of the total developed area of Dehradun Planning Area. As per the URDPFI Norms, area under recreational activities should be around 14 to 16 percent of the developed area for the better lifestyle of its citizens. More focus shall be given towards a dedicated Green Space for Dehradun Planning Area.

Figure 14-2: Dedicated Green Space



14.4.1 Transit Oriented Development

2 Corridors are proposed within the Dehradun City for Neo Metro Project that will change the entire characteristics of the city. High speed public transportation corridor not only improve the accessibility with reduce travel timing but it will also increase the land price of the surrounding areas. Influence Zone of 1000m on either side of the metro corridor shall be proposed where Vertical Development with higher FSI will be permissible. The prominent use of that zone will be commercial/ mixed use. This model is really helpful into the cities like Dehradun where availability of the developable land is very less.

Figure 14-3: Transit Oriented Development



14.4.1 Provision for Highway Facility Zones

As per the Guidelines issued by Ministry of Road Transport and Highways, Government of India, range of highway facilities will be provided at a specific interval on National and State Highways for passengers as well as truckers not limited to: parking for vehicles, food courts, rest rooms and kiosks for sale of local specialties for reducing the unemployment rate.

Figure 14-4: Provision for Highway Facility Zones



14.4.2 Improvement of NMT Infrastructure and Junction Design

Being an Education Hub, Tourist Town and State Capital of Uttarakhand, maximum population preferred walking to reach their destination. While many locals and tourists prefer for cycle track from Dehradun to Mussoorie especially on weekends. But the city has no existing cycle track due to which the dependency on motorized transportation is quite high. Only 38% roads are having dedicated footpath availability. But maximum patches have been encroached by street vendors and private parking. For better air quality and safe pedestrian movement, focus shall be given on development and improvement of NMT Infrastructure and Junction Designs.

Figure 14-5: Improvement of NMT Infrastructure and Junction Design



14.4.3 Provision for Affordable Housing

Due to lack of availability of the affordable housing especially to the urban poor of the city, around 20% of the total population is living in the slum areas of Dehradun. Being a state capital and education hub, the HH's who are living into the rented properties are more than 20%. The vision of 'Slum Free City' can only be achieved through an implementation framework of Government policies towards 'Affordable Housing for Urban Poor'.

14.5 MEDIUM TERM – PROJECTS BASED ON TIMELINE

14.5.1 Promotion of EcoTourism and better tourist infrastructure

Yearly tourist flow into the Dehradun and its surrounding areas are more than 30 lakhs. Peak has been observed during the Junda Mela, Summer Holidays and in winter during the snow fall in Mussoorie. Currently, maximum working population is dependent upon the tourism and related industries. Promotion of Eco – Tourism such as forest safari, camping sites including some adventure sports, homestay facilities etc. will be conserving the environment and improving the well-being of locals through economic support.

Transportation, Recreational, Sanitation, and Accommodation Facilities are the key factors for attracting the tourists to any city. The road, rail and air connectivity of Dehradun Planning area with its surrounding is quite strong in comparison to other tourist destinations. But, Sanitation, Accommodation and Recreational Activities are not as per the requirement. Special focus needs to be given to improve and develop these facilities to attract maximum tourists from national and international level.

Figure 14-6: Promotion of Eco Tourism and Better tourist Infrastructure



14.5.2 Revive the existing Built-up Areas

For revive/ regenerating the existing built-up areas those are poorly developed/ underdeveloped through Building and Zoning Regulation of Master Plans or through the implementation framework of it (such as: Local Area Plans) which ultimately improves the neighborhood, attract or retain the commercial activities as well as conserve the existing character/ built form of the city.

Figure 14-7: Revive the Existing Developed Area



14.6 LONG TERM – PROJECTS BASED ON TIMELINE

14.6.1 River Centric Master Plan

Rivers passing through the urban areas are their lifelines. However, due to unprecedented urbanization and manufacturing activities in the areas along the rivers, many of these have become polluted and, in some cases, unfit even for bathing and daily household activities. Flood plains of the rivers in urban areas have witnessed the construction activities including the unauthorized residential development, a phenomenon which has severely degraded the overall natural environment and river ecology.

Rispana, Suswa and Song are the major rivers that are passing within the Dehradun Planning Area. For Conservation of River Water and Restoration of areas around it, a River Centric approach needs to be adapted for addressing the objectives of: Eco- Friendly Development, Land Utilisation & Management and Pollution Control.

Figure 14-8: River Centric Approach



14.6.2 Conservation of Eco Sensitive Areas

For Conservation of Eco Sensitive Areas and Wildlife such as Rajaji National Park, Development and Tourism activities will be restricted through suitable provisions under the building and zoning regulations. New Development will be proposed by considering the notification of Eco Sensitive Areas issued by MoEFCC and through the consultation with the local bodies who are engaged into those areas. For effective conservation, 1km buffer shall be proposed from the ESA Boundary where construction activities shall be restricted through development control regulations and implementation frameworks.

Conservation Techniques, awareness among the local community will be generated through gram sabhas under the assistance of the authority.

Figure 14-9: Conservation of ESA



14.6.3 Integration of public transport system

Being an educational hub, tourist hub and state capital of Uttarakhand, it offers vast employment opportunities into the public and private sector. Main purpose of trip for maximum HH's is either education or work. Due to that reason all the public transportation facilities shall be properly integrated with each other for better accessibility, reduce travel time and for reducing the dependency upon the private vehicles.



14.7 MASTER PLAN 2041 PHASING AND FINANCING

14.7.1 Project Cost

There are two types of costs estimated viz. A) Land Acquisition and B) Development Cost. These have been estimated for major trunk infrastructure, necessary for the development of plan proposals. Several of these projects will require detailed feasibility estimates and preparation of detailed project reports prior to implementation.

A. Land Acquisition Costs- The land Acquisition for public purpose is the sole responsibility of the competent authority for the planning horizon from the sanction of the plan. It is desirable to acquire all land by authority for proper implementation of the plan. The acquisition costs are estimated based on the average prevailing Government Rate Card in Dehradun Planning Area. However, there are possible tools like TDR. It is assumed that these tools will be instrumental in acquiring land of roads, public amenities and open spaces.

B. Development Costs - Amenities & Recreational Open Spaces- It is suggested that the Competent Authority shall plan to develop the amenities and open spaces through private sector participation to reduce the financial burden on the authority and to ensure higher degree of plan implementation. Development cost shall be calculated for all the infrastructure facilities that will be required by the year 2041.

1. Road Cost

The development/ construction of some of the national highways (in Dehradun Planning area is taking place. Moreover, the road widening projects at many places are also taking place under SMART city Mission and Urban Mobility Projects. However, for the remaining Road & transportation proposals the major assumptions taken while calculating the road development cost have been mentioned below:

Regional Roads/ National Highway/ State Highway roads – the percentage of new roads shall be about 20% of the total proposed road length while the remaining 80% shall be existing roads requiring road widening

Major city roads/ PWD roads – the percentage of new proposed roads shall be about 10% of the total road length while the remaining 90% shall be existing roads requiring road widening.

Rest of the roads - the percentage of new roads shall be about 40% of the total proposed road length while the remaining 60% shall be existing roads requiring road widening.

Table 14-11 Costing of Proposed Roads

PROPOSED ROADS				
CATEGORY	UNIT	LENGTH	COST/KM (Cr.)	TOTAL COST (Cr.)
Proposed Roads (ROW- 45 m ROADS)	Km	41.86	15	627.9
Proposed Roads (ROW- 30m ROADS)	Km	6.37	12	76.44
Proposed Roads (ROW- 24m ROADS)	Km	22.50	09	202.5
Proposed Roads (ROW- 18m ROADS)	Km	35.47	07	248.29
Proposed Roads (ROW- 12m ROADS)	Km	21.71	05	108.55
Proposed Roads (ROW- 9m ROADS)	Km	36.16	04	144.64
Road Widening (ROW – 45m ROADS)	Km	48.75	07	341.25
Road Widening (ROW – 30m ROADS)	Km	95.04	06	570.24
Road Widening (ROW – 18m ROADS)	Km	130.37	05	651.85
Road Widening (ROW – 15m ROADS)	Km	0.047	04	0.188
Road Widening (ROW – 12m ROADS)	Km	111.41	03	334.23
Road Widening (ROW – 9m ROADS)	Km	414.45	02	828.9
FLYOVERS -03 (4 LANE- 03 KM EACH)	Km	9	100	900
FLYOVERS -03 (2 LANE- 03 KM EACH)	Km	9	50	450
TOTAL				5484.97

Note:

- In case of land acquisition for the road by the authority, the cost shall be calculated separately and expected to provide as a grant to the authority by the state government.
- Flyover has been assumed as a part of mobility plan to be developed for Dehradun in the near future by the respective department. Such cost can be altered as per specific design prepared for specific project
- All cost in the table is calculated as a block cost estimate on thumb rule basis. Detailed cost shall be derived by preparing DPR and detailed design as per requirement.

2. Water Supply Cost

Along with the proposed road length, water supply is to be calculated and their cost estimation will be carried out.

3. Sewerage and Drainage Network Cost

Similarly cost estimation has to be calculated for Sewerage and Drainage network along the major and minor roads.

4. Public and Semi- Public Amenties and open and recreation Space Development Cost

It is assumed that respective facilities shall be furnished by respective departments and can be considered to be taken care by other entities including other department or private partner. Project cost is worked out into the sector of Proposed Roads, Public and Semi-Public Use. Their details are described in table given below: For proposed roads, total cost is coming around 2066 Cr.

Table 14-12 Costing of Proposed Public/ Semi public Use

PUBLIC/ SEMI PUBLIC USE				
CATEGORY	UNIT	CAPACITY	PRICE PER UNIT (Cr.)	TOTAL COST (Cr.)
Water Treatment Plant	MLD	258 MLD	2 Cr	516
Sewerage Treatment Plant	MLD	140 MLD	2.5 Cr	350
Land for Solid Waste Dumping	Ha	40 Ha	30 Cr.	1200
TOTAL				2066

Note- All cost in the table is calculated as a block cost estimate on thumb rule basis. Detailed cost shall be derived by preparing DPR and detailed design as per requirement.

14.7.2 Project Revenues

Generally, development-planning projects are not leveraged as revenue components due to its social perspective. Simultaneously, an authority has to generate the capital needed to thrust the implementation process. There are several tools like Development Charges; Premium from Granting of Additional FSI, Additional Development rights, Saleable Components of Public Amenities and public lands. The revenues are estimated in accordance with the provisions of Development Plan and DCR, and are presented below.

A. Development Charges

The new developments in the proposed land use shall attract the development charges. This is charge may be levied one time or in phases which will help in generating revenues for the authority that shall ultimately help in the creation of infrastructure facilities.

B. Premium Charges on FAR (FAR permissible in addition to the Base FAR)

The proposed FAR system as prescribed in the DCR regulates the permissible FSI in two segments viz. Base FAR and purchasable FAR as per notified building by laws for plain areas and hilly region.

C. Grants/ Loans/ Funds from the Central govt / State govt /other financial institutions

MDDA shall receive different grants/ loans/funds from the central/ state government or other financial institutions for specific development projects. The funds shall be used specifically for the same projects the funds are allocated to and the revenue generated from the projects shall ultimately help in the creation of infrastructure facilities.

14.7.3 Development Phasing

The infrastructure needed to serve the projected population at build-out is substantially more than will be needed to serve the development expected in the early phases of the project. As a result, the provision of infrastructure and facilities will occur as the development they serve takes place. Since development of Dehradun will occur incrementally, this phasing provides a framework and threshold for providing the infrastructure necessary to serve development as it occurs. Implementation of Development Plan is divided into three phases coinciding with five-year plans namely:

1. Phase-1 2023-2030

2. Phase-2 2031-2035
3. Phase-3 2036-2041

This phased development will provide an analysis of the estimated annual development and its impacts on the city included projected city revenues from the development. In view of implementation of proposal in each phase priorities of subsequent phases shall be worked out and accordingly implementation has to be ensured.

Table 14-13 Implementation and Phasing Framework

SECTOR	PROJECTS	TIME	IMPLEMENTATION AGENCY
General Implementation	Development of Web- GIS Portal and linking proposed Land Use along with the registry of land	Short Term	Mussoorie Dehradun Development Authority
Housing	Provision for Affordable Housing	Short Term	Mussoorie Dehradun Development Authority
Physical Infrastructure	Development of Water Supply Network	Medium Term	Jal Sansthan
	Development of Sewerage Network	Medium Term	Jal Sansthan
	Development of Solid Waste Treatment Plant	Short Term	Nagar Nigam
	Development of Faecal and Sludge Treatment Plant	Medium Term	Nagar Nigam
Transportation	Transit Oriented Development	Medium Term	Mussoorie Dehradun Development Authority
	Road Widening and Flyovers	Short Term	NHAI
	Development of Bypass Ring Road	Medium Term	NHAI
	Improvement of NMT Infrastructure and Junction Design	Short Term	PWD/ Smart City
	Integration of Public Transport System	Long Term	Mussoorie Dehradun Development Authority
Environment	River Centric Master Plan	Long Term	Mussoorie Dehradun Development Authority

	Inclusion of Dedicated Green Space	Short Term	Mussoorie Dehradun Development Authority
	Conservation of Eco-Sensitive Areas	Short Term	Mussoorie Dehradun Development Authority
	Reviving the Existing Built-up Area	Medium Term	Mussoorie Dehradun Development Authority
Recreational	Provision of Eco Tourism and Better tourism Infrastructure	Medium Term	Uttarakhand Tourism Department
	Development of Parks and Open Spaces	Short Term	Mussoorie Dehradun Development Authority

Note- Priorities of the projects can be altered according to the project feasibility and sanctioned allotted funds from various aids/ grants/ budgets/ funds from respective departments.

PROJECTS	PHASE-1 (2023-2030)								PHASE-2 (2031-2035)					PHASE-3 (2036-2041)						
	23	24	25	26	27	28	29	30	31	32	33	3	35	36	37	38	39	40	41	
1. HOUSING																				
Provision for Affordable Housing																				
2. TRAFFIC AND TRANSPORTATION																				
Transit Oriented Development																				
Road Widening and Flyovers																				
Development of Bypass Ring Road																				
Improvement of NMT Infrastructure and Junction Design																				
Integration of Public Transport System																				
3. PHYSICAL INFRASTRUCTURE																				
Development of Water Supply Network																				
Development of Sewerage Network																				
Development of Solid Waste Treatment Plant																				
Development of Faecal and Sludge Treatment Plant																				
4. ENVIRONMENT																				

PROJECTS	PHASE-1 (2023-2030)								PHASE-2 (2031-2035)					PHASE-3 (2036-2041)					
	23	24	25	26	27	28	29	30	31	32	33	3	35	36	37	38	39	40	41
River Centric Master Plan																			
Inclusion of Dedicated Green Space																			
Conservation of Eco- Sensitive Areas																			
Reviving the Existing Built-up Area																			
5. RECREATIONAL																			
Provision of Eco Tourism and Better tourism Infrastructure																			
Development of Parks and Open Spaces																			

15 IMPLEMENTATION STRATEGIES

15.1 URBAN LAND MANAGEMENT TOOLS AND TECHNIQUES

The urban landscape is transforming extensively each day as many new projects are developed over the agriculturally productive hinterland of the cities. In urban areas, land and economic opportunities are the base for all development activities, broadly classified as urban and rural areas.

The value of urban land in India is primarily influenced by the prevalent market forces, which directly or indirectly determine the supply and demand for land. The value of land increases as demand exceeds supply. As the urban economy grows, its economic structure changes, due to which improvements in economic conditions can be observed. The increase in household income creates a desire for better housing and living conditions and a better quality of life. As a result, demand for urban land increases.

In most cities and towns of the country, suitable land exists but is available in limited quantity for development. The main tool available to the Government to regulate the supply of land is the conversion of rural land into urban land through land-use conversion controls and by providing the basic infrastructure in the area. The challenge in this process is to supply land, at the right time, in desired locations, and with timely infrastructure provision. Historically, land acquisition in the urban centres has been the prerogative of the Development Authority concerned. It has been felt that government interventions in the urban land market are mainly to:

1. To eliminate market imperfections and failures to increase operating efficiencies
2. To remove externalities so that the social costs for land market outcomes correspond more closely to private costs
3. To redistribute the city's scarce resources so that disadvantaged groups get an equal share in society's output

Land assembly and development mechanisms are undertaken to achieve optimum social use of urban land and to ensure adequate availability of land to public authorities and individuals. Public Private Participation is achieved in land development through various techniques. Mainly, land assembly techniques prevent the concentration of land in a few hands and promote its efficient social and economic allocation. Some land assembly techniques also promote flexibility in land utilisation in response to changes resulting from the growing city.

The various mechanisms to assemble and/or develop land are enlisted below:

- 1) **Land Acquisition:** Bulk land acquisition by State and by private initiatives.
- 2) **Land Pooling:** Land pooling approach and redistribution scheme, popularly known as Town Planning schemes or township scheme
- 3) **Land Reservations:** The concept of Accommodation Reservation which allows the land owner to develop the sites reserved for an amenity.
- 4) **Transferable Development Rights:** A technique of land development which separates the development potential of a land parcel for use elsewhere.
- 5) **Guided Land Development:** This model uses the provision of infrastructure as an instrument to guide urban development in partnership with landowners without pooling any land.

15.1.1 Land Acquisition

“Land Acquisition” popularly means the acquisition of land for defined public purpose by a government agency from individual land-owners, as authorized by the law, after paying a government-fixed compensation to cover losses incurred by land-owners from surrendering their land. The land acquisition process can be undertaken by the State or private initiatives.

Land acquisition is a key tool for statutory planning, freeing up land from all encumbrances. The land acquisition is to be processed as per the Right to Fair Compensation and Transparency in Land Acquisition, Rehabilitation & Resettlement Act (RFCTLARR) 2013. Some models of land acquisition are as follows:

A. Bulk land acquisition method as a State Initiative: In this method, Master Plan is prepared for the entire area encompassing different land uses and involving various activities. Land is developed in accordance to the planning norms for various uses/activities. Bulk land is acquired from farmers by the development agency and compensation is paid to farmers/owners based on the provision of prevailing act.

B. Bulk land acquisition method with Private Initiative: To defray the cost of land acquisition some state governments and ULBs have developed models in which private sector acquire land by directly paying compensation to the affected families. A variety of models are in existence per which land is acquired for planned development with private partnership.

C. Haryana Guided Land Development Model: In this model, the private developer can acquire land directly from farmers at market price and at the same time, it permits a land owner to assume the role of a colonizer. This model provides fixed time period of 5 years to utilize that land acquired (initially 2 years, then extension of 3 years, if required) and the developer is expected to complete the projects within this period. Major highlights of this model are that the difficulties and delays inland acquisition are avoided and pressure on government to pay compensation is reduced, overall enhancing investments.

D. Ghaziabad Joint Venture Model: As per approach followed by Ghaziabad Development Authority (GDA), a joint venture (JV) is formed between the GDA and the builders/developers/co-operative societies through open bid (based on technical and financial capabilities). Twenty per cent of the plots developed are to be reserved for EWS/LIG and the costing and allotting of social facility by developer has to be done as per the government regulations. The balance of the land is to be sold by the developer at profit. For the entire process, the development authority acts only as a facilitator. Project duration is specified in the JV agreement and penalty is imposed if developer requires time extension, thus making sure that land is utilized within the stipulated time period.

E. Hyderabad Differential Compensation Models: In Hyderabad, the land acquisition technique has been modified into two different models, in which while acquiring land for public and private projects, different level of compensations are arrived at, these are:

Model-I: When land is acquired for projects mainly for public purpose such as roads, power generation and distribution, irrigation, schools, welfare housing, environmental projects etc., appropriate compensation is paid to land-owners by consulting them.

Model-II: When land is acquired for projects such as SEZ, Industrial Estates, Satellite townships and others where value addition enhances the land prices substantially, mainly for third party use, compensation is normally worked out on profit sharing basis, which is in two parts, namely-

Basic Value (Government Rate) of Land

% Equity Sharing in SPV / % of Net Developed Area / Built Space

F. CIDCO Model: CIDCO model of Land Development in Navi Mumbai follows the technique of land banking for land assembly. The compensation to land owners is done by the way of monetary and land compensation. But in Vasai Virar sub-region, CIDCO undertook the land

assembly by obtaining power of attorney from land-owners or outright purchase of freehold lands located close to each other by private developers or builder. The promoter is solely responsible for providing and maintaining infrastructure for consolidated land parcel.

15.1.2 Land Pooling

In Town Planning or Plot Reconstitution Scheme, the land is pooled and its development is financed with the involvement of land-owners without compulsorily acquiring land. This land assembly technique helps to provide plots for basic services in a planned layout from the original haphazard arrangement. Costs incurred by the developmental authority for development and for infrastructure are recovered from the sale of few of the final land plots reserved by the authority and betterment charges levied on land-owners. The reconstituted plots are allotted to the landowners in proportion to their original land holdings.

The scheme was first introduced in the Maharashtra Regional and Town Planning Act, 1966 and later in Gujarat Town Planning & Urban Development Act, 1976 and is now widely appreciated model of land assembly. Another deviation of the land pooling mechanism has been recently introduced by the Delhi Development Authority (DDA), wherein DDA facilitated developers and land-owners to pool land for development. The town planning scheme is referred as 'land acquisition without tears' and has the following key advantages:

- 1) Infrastructure is provided in coordinated way.
- 2) Partial cost is recovered through betterment charges.
- 3) Land for public and community purposes including green & open spaces is acquired without direct expenses.
- 4) Community benefits through unified planning.
- 5) Land-owner shares the project cost and benefits by increased property prices.

Town Planning Scheme has emerged as a successful model of land development. The Maharashtra Regional and Town Planning (MRTP) Act, 1966. The Gujarat Town Planning and Urban Development Act (GTPUDA), 1976 and now Kerala Town and Country Planning Ordinance, 2013, have included provisions for Town Planning Scheme.

The T.P. Scheme is prepared by the authorities generally for an unplanned area of about 100 Ha. Planning this area in detail it may require about 40% of land for road network, public purpose like school, hospital, market, park, playground etc. and for plots for sale and the remaining 60% area can be utilized to formulate final Plots for the allotment to land owners as plots. As a result of this planning exercise, 40% of land is deducted from the ownership of all the land owners proportionately and allotted to the authority to undertake the respective development works for public as per the T.P.S. proposals. The remaining 60% land in form of plots is given back to the land owners on proportionate basis. The land owner will lose 40% of land and will get back 60% land in form of Final Plot. All the land owners will have this kind of adjustment.

The entire area through this mechanism becomes well planned. Everybody contributes part of their land for public purpose proportionately. Every land owner is paid compensation for the land he is contributing (about 40% land area) and in turn he pays the incremental contribution authority for the betterment of his land by virtue of this planning. There is no land acquisition and nobody is deprived of his land. On the sanction of the preliminary scheme under Section 67 of the Act, the land readjustment will come into force as per the scheme documents. Accordingly, all the original boundaries of the Original Plot will be changed automatically to the new boundaries of the Final Plot. The roads, public purpose plots and the plots for sale will vest in the authority.

Through TP scheme land for public facilities and services are made available at right location and at right time. All such public purpose lands are equitably apportioned from the landowners.

Planning efforts can keep pace with the growth and rapid urbanization thereby reducing scope for haphazard urban sprawl. TP Schemes facilitates decentralization of planned development activities in core as well as outlying areas of the city. Town planning scheme encourages optimum use of scarce developed urban land through efficient layouts and using of urban land as resource to check land speculation. By implementing TP Scheme, the build ability of the reconstituted plot increases with regular shape, improvement in accessibility, increased potential of development, availability of social and physical infrastructure in the neighborhood, better linkage with other part of the city and improvement in living environment.

15.1.3 Land Reservation

The concept of Accommodation Reservation allows the land-owners to develop the sites reserved for an amenity in the development plan using full permissible Floor Space Index (FSI)/Floor Area Ratio (FAR) on the plot, subject to agreeing to entrust and hand over the built-up area of such amenity to the local authority free of all encumbrances and accept full FAR/FSI as compensation in lieu thereof. The area utilized for the amenity would not form part of FAR/FSI calculation. Reservations such as retail markets, dispensaries, etc. can be implemented in this way wherein local authority is not required to acquire the land by incurring expenditure on payment of compensation. In case of reservations like shopping centers etc., the owner can be allowed to develop these on agreeing to give at least up to 25% of the shops to the local authority for the purpose of rehabilitation of the displaced persons on payment of cost of construction.

In case of road widening/ new construction, the local authority can grant additional FSI on 100% of the area required for the purpose, provided the owner surrenders the land for widening or construction of new roads to the local authority free of all encumbrances and accept the additional FAR/FSI as the compensation in lieu thereof. This mechanism has considerably relieved local authorities from incurring huge expenses for the purpose of acquisition of such lands. The model can be explored for other non-economic activities such as open spaces, public utilities among others. The concept of accommodation reservation has been incorporated in the Development Control Rules of the Mumbai Municipal Corporation.

15.1.4 Transferable Development Rights

TDR is a technique of land development, which separates the development potential of a particular parcel of land from it and allows its use elsewhere within the defined zones of the city. It allows the owner to sell the development rights of a particular parcel of land to another. This entitlement is over and above the usual FSI available for receiving plot in accordance with the prevailing laws and regulations, which entitles a land-owner to construct additional built-up area on his existing building or vacant land.

TDR is taken away from the zone and it is tradable which makes it different from Accommodation Reservation. This is also generally used for redevelopment of inner-city zones and for reconstruction/ re-development and has been tried out in numerous cities/ States including Bengaluru, Chennai, Mumbai and Rajasthan. However, it has its prospects and consequences as experienced from the implementation in various cities. For instance, unbridled pooling of TDRs could damage the urban form, TOD strategies, quality of public spaces, etc. Hence it should be used carefully within a predefined spatial framework. States like Karnataka and Rajasthan have made provisions to mitigate such effects.

Alternative to monetary compensation could be award of Transfer of Development Rights either to remainder of the land or to a distant location. This could be in three generic cases viz.

Roads and Road widening: Development rights calculated at the FAR permissible in adjoining area may be allowed to be used in the remainder of the plot up to a limit. Development rights that cannot be so consumed can be transferred elsewhere in receiving areas. If FAR is related to width of the road, resistance to widening may get reduced.

Public purposes on open land or exclusive plots: Lands required for parks and playgrounds or exclusive uses like secondary school, fire station etc. can be obtained by providing TDRs in lieu of compensation. However, price differentials in originating and receiving zones could be considered as an incentive in such cases.

Public purposes that require built-up space but not necessarily exclusive plot: Examples of this could be municipal vegetable market, library etc. In such cases, landowner may be permitted to use the full potential of development in terms of FAR over the plot provided he offers the built up space required for the public purpose to the local body.

15.1.5 Guided Land Development

Guided Land Development model uses the provision of infrastructure as instrument to guide urban development. This is done in partnership with land-owners who pay for the cost of providing services to their land and in return donate land for public infrastructure and a payment as betterment levy. This model, also proposed by the United Nations Economic & Social Commission for Asia & Pacific (UNESCAP), has been for guiding the conversion of privately owned land in the urban periphery. It uses a combination of traditional government role of providing infrastructure and the enforcement of land subdivision regulations. The key advantage of the approach is that it is less costly than outright land acquisition and more equitable than land banking.

The principle behind guided land sub-division is that the government agency proactively selects the direction where it feels urban development should take place and provides infrastructure in those areas. This acts as an incentive to encourage developer to invest in the planned area selected by the government agency. The cost effectiveness of guided land development approach results from the fact that land development is planned, designed and implemented with the land-owners of the designated area, who donate land for roads and right of way for infrastructure and public spaces, as well as pay a betterment levy to meet the costs of the project. To finance the scheme, a loan is initially taken to build the infrastructure, which is paid from betterment levies provided by land-owners either on annual installments or in lump sum upon sale of land. The infrastructure is provided by the government agency up to the site. Individual land-owners are supposed to subdivide their land for various developments and lay the on-site services. But guided land is often fraught with difficulties on the ground. First, as the model depends on the consent of the land-owners it cannot be applied in areas with fragmented land-ownership, lack of owners' will and consensus. Second, collection of betterment levies may not be feasible by small landholders and lead to default of payment.

15.2 DEVELOPMENT WITHIN GREEN DEVELOPMENT AREA

The prominent green areas in Dehradun are reserved forests, tea gardens, Wildlife areas, Tea clad areas, gardens, parks, playgrounds, green belts, tree covers etc. These green spaces need to be protected, and no unnecessary encroachments should be encouraged. Urban Greening Guidelines should be proposed to maintain and preserve urban greens by Development Authority. While framing zoning regulations, it has to be ensured that only those activities are to be allowed which may not have any adverse impact on the environment. Necessary steps has to be taken for strengthening the slopes by afforestation and regulating construction activities without compromising the natural environment near mountain areas.

It should be ensured that the different open spaces must be interlinked by providing connectivity/linkages and should be maintained/ developed in an integrated manner. In densely populated core city areas, planned green spaces shall be provided as neighborhood parks, plantations, and small green spaces.

Ecotourism in green areas like Rajaji National Park have should be promoted for low-impact nature tourism, which ensures the ecological integrity of the environment. Promote partnerships amongst stakeholders for mobilizing resources and developing and promoting nature tourism will be helpful for the economic growth of the region. Furthermore, there should

be a provision for green development by legally protecting environmentally critical areas or the design and planting of a new green space.

Various policies have been framed by various State/ Central authorities in these directions. Some of the examples are given below:

A. Green Development Area Policy – Delhi Development Authorities Green Development Area Policy will provide an integrated framework for ‘green-oriented’ development in the city, help curb pollution and enable investors to monetize land investment. Also, it aims to regulate development in designated rural areas and green belts in the city and seeks to incorporate the low density residential areas (LDRA) of the capital where most of the farmhouses are located encompassing an area of 54,000 acres.

B. Urban Greening Guidelines, 2014 – It is an outcome of blatant and random concretization of pavements in Indian cities. Of late, a number of Urban Development Authorities and Urban Local Bodies have undertaken large scale concretization of pavements which has resulted in destruction of a large number of trees by first rendering those weak and reducing their lives and consequently most of them falling down on account of moderate winds and storms. In 2000, Ministry of Urban Affairs and Employment had published Guidelines for Greening of Urban Areas and Landscaping. The Guidelines suggest steps for protection of trees and enhancing their lives while undertaking concretization of pavements.

15.3 URBAN REGENERATION AND URBAN RENEWAL

Urban regeneration brings back underutilized assets and redistributes opportunities, increasing urban prosperity and quality of life. Urban regeneration initiatives are complex, lengthy and run the risk of gentrifying private space or privatizing public one. It requires a diversity of approaches, such as redevelopment of brownfields, densification and intensification strategies, the diversification of economic activities, heritage preservation and reuse, public space reactivation and strengthening of service delivery. All these projects/ activities should be according to the building byelaws and various sector specific policies those are prevailing in that area to protect the environment and the existing structure/ Façade/ Landscape. There is a plenty of scope of Urban Regeneration Projects especially in the core city area of Dehradun where the various economic activities have been concentrated.

Each city approaches urban renewal according to its means and its political and administrative systems. One of the chief activities of urban renewal is redevelopment, which is achieved through the clearance and rebuilding of structures that are deteriorated or obsolete in themselves or are laid out in an unsatisfactory way. Other aspects of urban renewal involve the reuse of the land for new purposes, rehabilitation of structurally sound buildings that have deteriorated or lost their original functions, and conservation—a protective process designed to maintain the function and quality of an area. In Dehradun City, more than 25% of the current census population has been living in the slum areas where there is no proper provision for the physical and social infrastructure. Current Housing Policy (Pradhan Mantri Awas Yojana - Urban) has provision for the slum redevelopment component with detailed methodology to implement it. Concerned authorities should identify the areas where it shall be implemented.

15.4 LAND BANK CREATION

Land Bank shall be created through various urban land management tools and techniques those are mentioned in the previous sections. Furthermore, special provisions shall be given in ‘The Uttarakhand Urban and Country Planning and Development Act, 1973’ for its proper implementation.

15.5 VACANT GOVERNMENT LAND CREATION

The Optimum Utilization of Vacant Government Land (OUVGL) is a scheme for identifying vacant government land (including municipal land) and using it as source for providing land for public purposes. However, given the need for using government land for generating financial resources, entire stock of government land need not be assigned to non-remunerative public purposes. In fact, government land would offer many opportunities for PPP where part of the land could be used for public purpose. For example, a plot of government land could be allocated for an intercity bus terminal with a budget hotel or commercial shops. Rationalizing obsolete uses of public lands could be another way of putting public land to more relevant public purpose.

The land under the ownership of various government departments and the respective authorities (Municipal Corporations / Nagar Parishads / Nagar Panchayats) falling in local planning area, can be used mainly for creating public utilities, services, physical and social infrastructure including parks, open spaces, community facilities etc.

15.6 TRANSIT ORIENTED DEVELOPMENT

TOD is an effective development concept that helps to guide and manage growth while addressing climate change issues, promoting quality of life environmental improvements and potentially encouraging infill development and therefore densification. Moreover, TOD can increase mobility and public safety; increase households' disposable income and contribute to affordable housing by creating the opportunity for low-cost and accessible housing, and reducing transportation expenditures.

Transit-oriented Development Zones are identified and delineated by the concerned development authority for high density – compact development. It is one of the necessary tool for cities like Dehradun where availability of the developable land is less for city expansion. Projects identification and implementation shall be as per the provision of the 'Uttarakhand Transit Oriented Policy' for which the draft has been prepared in the year of 2021.

15.7 INSTITUTIONAL FRAMEWORK

The implementation of Dehradun Master Plan 2041 will be done in a defined and suitable framework. Some of the examples are listed below:

15.7.1 Inter-Agency Coordination

There must be proper coordination among the departments for master plan implementation. There must be a 'plan monitoring and surveillance cell' within the development authority, headed by the senior Town Planner for reviewing and on-ground verifications on regular basis. This is meant to ensure effective implementation of the Plan as per the envisaged phasing of development. It will also ensure that the Plan does not remain static, its proposals are reviewed and evaluated continuously, and it can respond to changes, if any, in the socio-economic development scenario in the region. The total project area should be subdivided into various planning zones/sectors to be headed by the town planner. For each of the planning zones/sectors proposed to be developed, nodal officers/town planners are identified for day-to-day activities, permissions, regulations and development reviews.

The monitoring cell shall also ensure no unplanned or unintended growth in the Dehradun Planning Area. Any mishap should be reported directly to the zonal-level planning officers. For these purposes, the cell should be provided with technical facilities to analyze primary and secondary data to track deviations or changes in the Master plan, if any.

15.7.2 Resource Mobilization

The department should be made more efficient and effective through capacity building where more qualified staff, training, attractive incentives etc., will act as administrative machinery for revenue generation. The department can also introduce National Training Entity by the Ministry of Housing and Urban Affairs program to meet the strategic interests and delivery gaps. Programs can be offered in the form of in-person workshops as well as curated study tours, employing a self-learn pedagogy through components like expert and implementer interactions, group exercises and discussions, field surveys and site visits, learning games and videos for many topics, including public bicycle sharing, transit-oriented development, safe accessibility, use of GIS in urban planning and administration, pedestrianisation, and parking management.

15.7.3 Revenue Generation

The primary revenue sources for local bodies are their own revenues and government grants. Own revenue resources include tax and non-tax revenues released by them. Government grants comprise funds released by the State Government and Government of India (GoI) on the recommendation of the State Finance Commission (SFC), Central Finance Commission (CFC); and State Government and Government of India (GoI) share for implementation of various schemes. The development authority also obtains loans for the performance of various schemes related to urban development. Apart from the above sources, development authorities derive income from fees, fines, penalties, loans, grants and contributions.

15.7.4 Suggestions for Improvement

The authority should develop its own resources and generate income revenue. The funds and finances of ULBs need to be improved through effective improvement in the financial sphere. The efforts should be put on to recover the legally valid imposed taxes from individuals, groups, enterprises or whosoever is concerned, as the case may be. This can be in the form of tax and non-tax revenue. The department should also emphasise expanding non-tax revenue sources through local enterprises, trading and housing, which may also give them a social advantage.

The department can also strengthen its revenue mobilisation at the local level. The development authority may use the general principles of 'users pay, beneficiaries pay, and polluters pay' to justify that the citizens are well aware of the need for their contribution towards the more significant societal cause. The table below shows conventional and non-conventional resources that can be tapped by the development authority.

16 LAND USE ZONING AND DEVELOPMENT CONTROL REGULATIONS

16.1 INTRODUCTION

Zoning regulations are laws of development authorities that dictate the use of land and the construction of buildings/ Premises. In zoning, the land is divided into different zones where different land use patterns are enforced. For developing the zoning regulations for Dehradun Planning Area the existing situation analysis, URDPFI guidelines and previous master plan 2025 zoning has been considered. The activities listed in “Permitted”, in the following section of different Land Use and its sub-zones are allowed in the particular land use and subzones. The activities listed in “Permitted by board” under each land use and its sub-zones will be permissible under the permission of the Competent Authority after analysing the merits and demerits of activity in any Landuse Zones and its immediate surrounding.

16.2 OBJECTIVES

The objective of the development/control regulations of Dehradun Master plan 2041 is to promote and regulate development controls for buildings/activities within use premises following the development policies and land use proposals contained in the Dehradun Master Plan 2041. This regulation will be effective throughout the Dehradun Planning Area. To achieve compatibility between the different land uses that are proposed in the plan, a set of broad Zoning Regulations are proposed defining the proximity of such uses with each other, so that adverse externalities do not arise. The various activities/Landuses have been grouped into classes (use zones) and sub-classes (premises use) where they can or cannot be put together in a geographical domain

16.3 CLASSIFICATION OF REGULATIONS

The various land use zones mentioned in the Master Plan will be regulated through the zoning regulation by two classes mentioned below.

16.3.1 Permitted activities

These activities are permitted within the particular land use zone. There may be further conditions imposed, like approach road width, minimum plot or maximum plot area for some particular activity (mentioned along with the activity).

16.3.2 Permitted by board

Approval of these activities is subject to prior application to the concerned authority. The approval may be provided by the competent authority after satisfactory conclusion of its location and impact to surrounding areas, carrying capacity of the area as well as cost-benefit of that particular project/activities/building/premises.

16.3.3 Prohibited Activities

The activities which can have adverse impact or are of non confirming activity to the defined land use zone are mentioned under this class and activities /landuses which are not listed under permitted and permitted by board category will be treated as prohibited activity and permission for those activities shall not be allowed.

16.3.4 Issue resolution

Permission for any activity or use by the applicant under the zoning regulations may not be obtained as a right.

16.3.5 Impact Fee:

If a land use category is allowed which is relatively more active urban use under the "permitted and permitted by board" category of the zoning regulation, these activities will likely result in attracting more traffic, stress on infrastructure and comparatively have more environmental impact in the immediate surrounding area. Therefore, in such cases "Impact Fee" will be applicable. It is clarified that, only Impact Fee will be payable for permitted activities /uses based on the zoning regulation. Impact fee will be decided by the board of development authority but, it should not be less than the land use conversion fees (as applicable zone wise).

1. Impact fee will not be payable under the following circumstances –

- Permitted activities/ uses in the built up area.
- Public facilities developed by government and semi-government agencies
- Public / semi-public recreational activities.

2. Impact Fee will be applicable on the regularization/approval of Land Uses for Deviated Land Uses from Zonal Plan- 2025, i.e., Deviated Residential (DR), Deviated Commercial (DC), Deviated Industries (DI), Deviated Public/Semi-public(DSP) under the category of unauthorised development which is defined in „The Uttarakhand (The Uttar Pradesh Special Area Development Authority Act, 1986) Adaptation and Modification Order, 2006 (Amendment) Act, 2008" and Uttarakhand (Uttar Pradesh) Revenue Code, 2006

16.4 OTHER REQUIREMENTS

1. Permission for any activity or use by the applicant under the zoning regulations may not be obtained as a right.
2. Construction of all Activities listed in the zoning regulation will be permitted as per prevailing building by Laws.
3. According to the recommendation of the committee, maps will be approved by the authority from time to time, following the orders issued by Hon'ble. Supreme Court/High Court and National Green Tribunal.
4. Rajaji National Park- No Development Zone: Any Building Permission in the protected Rajaji National Park- No Development Zone shall seek the prior approval of Director, Rajaji National Park and avail NOC (No Objection Certificate) letter for the development authority to provide building permission in the said zone.
5. Development/Construction of public utility infrastructure will be allowed in the forest land use area specified in the Master Plan, after the permission of the Forest Department.
6. In case of any Private Development/ Building/ Structure/ Activities/ Land found in Forest area/Tea Garden with the claiming certificate/letter of not being Forest Land/Tea Garden Land from respective department/governing body, such cases for the land use should be determined by the authority board.
7. In the case of not specified road width in the Masterplan, additional 3.0 m width should be added from the existing road width.
8. Such activity/use whose change of land use has been done already by Government of Uttarakhand or layout has been approved by District Development Authority/Competent Authority, is deviation from land use allocated in the present Master plan, the changed Land use/approved layout will be considered valid.

9. If any activity /use has been remarked in all the categories of regulation or a situation of contradiction arises, such cases can be settled on the basis of merit to the authority board with the opinion of the Chief Town and Country Planner.

10. Dehradun is covered with Environment sensitive zone and to minimize Green House gas emissions, heat Island effect and carbon footprint from human activities, it is necessary to promote green buildings and green/eco fuels. For this, it is necessary to obtain green buildings rating in cases of area larger than 1000 SqM.

11. To preserve natural drains/waterbody/stream/river/lakes/pond, provision of Green Belt/Buffer should be considered from the edge of such natural feature. This green belt may be use, as per requirement, for tree plantation/open space/development of parks etc.

S.NO	PRESERVED AREA	BUFFER(MTR.)
1	Main River (Distance from river bank/highest water level, whichever is higher)	50
2	Primary Drains (As Defined in Map – stream Order)	35
3	Secondary Drains (As Defined in Map – stream Order)	25
4	Tertiary Drains (As Defined in Map – stream Order)	15
5	Ponds/Lake (As Defined in Map)	10
6	Any other Drains found on ground or in revenue records shall be considered and defined under above four listed category by the authority.	As per definition

12. To maintain the building line along main road, a setback as per mention below/as per building by-laws (whichever is higher) will be applicable.

Sl. No.	ROW of Road	Building Line (Mtr.)
1	60	8
2	45	7
3	30	6
4	24	5
5	18	4
6	12	3

13. If existing ROW of any road under the category of NH, SH or comes under PWD, is more than proposed ROW in the Master Plan, the existing ROW will be considered.

14. If any activity has been rewritten in all categories of zoning regulation or having a conflicting situation arises, in such cases matter shall be settled on merit basis through the Authority

15. Exclusive Parking use shall be permitted in all zones.

16. No change of Land Use will be allowed in the following land uses –

17. Affordable housing

18. All categories under public utilities like fire station, cremation and burial ground, water treatment plant, sewage treatment plant etc.
19. All categories under Green zone /Orchards
20. Waterbodies
21. All Categories under protective zone
22. Individual Houses will be permitted as per zoning regulations (listed in permitted by board Category) subject to the condition that applicant must have land registry before the date of notification of this master plan.
23. Such activities in Master Plan which is not defined than the consent report of chief town and country planner will be treated as final decision.
24. Cantonment area precincts it is necessary to obtain specific clearance from cantonment board, after consultation be cantonment committee before undertaking certain kinds of development and re development as specified in zoning regulation, or issued as specific guidelines. The Regulations allow special exemption from land use controls in the interest of cantonment.

16.5 BOARD LAND USE CLASSIFICATION

The proposed land use plan incorporated in the Dehradun Master Plan, 2041 notified area depicts the following land use class and sub-class (refer to Table 14-2).

Residential

R1: Built up Residential

Permitted Activities

In this Landuse Maximum Building Height permitted will be G+2 based on the aligned road width mentioned in the building Bye Laws Uttarakhand clause (ii).

1. Individual House
2. Government Housing Scheme (Only for slum redevelopment/improvement schemes)
3. Government Quarter
4. Renovation and Modification of Existing/ Sanctioned Hostel
5. Retail Shop
6. Daily Need shops
7. Private Office (The plot area must not be larger than 45 sq.m.)
8. Service Industry
9. Cottage and Household Industry (Maximum Plot area 200 sq m only)
10. Existing/ Sanctioned School
11. Anganwari Centre
12. Clinic / Dispensary (Maximum Plot area 45 sq m only)
13. Veterinary Dispensary / Hospital for pets only
14. Government Offices (It must be on minimum 18m wide approach road only)
15. Bank/ATM

16. Police Station / Police Post
17. Public Library
18. Creche / Day Care / Kindergarden
19. Public Toilet
20. Religious Building
21. Milk Collection Centre (Minimum 18m wide approach road)

Permitted by Board

1. Hospitals/Nursing Home/ Diagnostic Centre/Other Medical Units (Maximum Plot area (750 sq M) (Impact fee applicable)
2. Community Hall (on 18 M wide approach/ Master Plan Road) –
3. Multi-Storey Parking (Minimum 18m wide approach road)
4. Orphanage / Old Age Home/Home for Handicapped Children (It must be on minimum 18m wide road)
5. Sports Centre/Complex
6. Gymnasium
7. Club House with Swimming Pool (Impact fee applicable)
8. Government Night Shelter
9. Bus Stop
10. Taxi / Auto Stand (Applicable on a minimum 18m wide approach road)
11. Parking Space / Area
12. Electric Vehicle Charging Dairy Booth
13. All Government/semi government Institutions/ Activities which contribute to public welfare, and does not have any adverse affect on its immediate surrounding, will be allowed through the concent report of Competent officer.
14. All the terms and conditions will be applicable along with the activities/land uses during the renewal/freehold lease of State Nazul Land (if applicable).

R3: Residential Zone**Permitted Activities**

1. Individual House
2. Sub Division Residential Layouts
3. Group Housing (Apartment / Flatted Housing)
4. Residential Township
5. Government Housing Scheme
6. Retail Shop
7. Private Office (The plot area must not be larger than 45 sq.m.)
8. Hostel (Maximum area 1000 sqm)
9. Service Industry (As per Zoning annexure III)
10. Cottage and household Industry (Maxumum area 200 sq m)
11. Anganwari Centre
12. School (Minimum 12m wide approach roads only)

13. Clinic/ Dispensary (maximum plot area 45 sq.m. only)
14. Veterinary Dispensary / Hospital for Pets only
15. Government Offices (It must be on minimum 18m wide approach road only)
16. Government Quarter
17. Bank / ATM
18. Police Station / Police Post
19. Guesthouse (It must be on a minimum of 18m wide approach road only)
20. Art Gallery
21. Public Library
22. Creche / Day Care / Kindergarden
23. Public Toilet
24. Orphanage / Old Age Home/Home for Handicapped Children
25. Fire Station (Minimum 24m wide approach roads)
26. Religious Building
27. Playground
28. Recreational Club (Minimum 18m wide approach road)
29. Sports Centre/Complex (ROW – Minimum 24 m wide road)
30. Gymnasium Impact fee applicable
31. Swimming Pool
32. Milk Collection Centre (Minimum 18m wide road)

Permitted by Board

1. Shopping Mall (On minimum 24 m wide road and outside municipal limit only. The maximum ground coverage area of 35%) Impact fee applicable
2. Multiplex / Cinema (On minimum 24 m wide road and outside municipal limit. The maximum ground coverage area of 35%) Impact fee applicable
3. Petrol Pump / LPG filling station (It must be on a minimum of 24m wide approach road only. Applicant must obtain NOC for fire safety from the fire department) Impact fee applicable
4. College (Minimum 24m wide approach roads and Minimum area 1 acre)
5. Indoor / Outdoor Stadium (Must be within 12m and 18m wide approach roads only)
6. Multi-Storey Parking (Minimum 18m wide approach road)
7. Hotel /Lodge / Restaurant (On minimum 18m wide approach road and area greater than 1000 sq m only) Impact fee applicable
8. Hostel (area greater than 1000 sq m only)
9. Hospital and Nursing Home (It must be on a minimum of 18m wide approach road only) (Impact fee applicable for Private Facility)
10. Dharmashala (Minimum 18 M wide Road)
11. Diagnostic Centre/Other Medical Units
12. Community Hal. (It must be on minimum 18m wide road)
13. Bus Stop
14. Taxi / Auto Stand (Applicable on a minimum 18m wide approach road)

15. Parking Space / Area
16. Electric Vehicle Charging Station Dairy Booth
17. Golf Course / Race Course
18. Hotel /Lodge / Restaurant/Tourist unit as defined in building bylaws (On minimum 18m wide approach road and Maximum area 1000 sq m only) Impact fee applicable
19. All Government/semi government Institutions/ Activities which contribute to public welfare, and does not have any adverse affect on its immediate surrounding, will be allowed through the concent report of Competent officer.
20. All the terms and conditions will be applicable along with the activities/land uses during the renewal/freehold lease of State Nazul Land (if applicable).

R4: Affordable Housing

In this Landuse Maximum Building Height permitted will be G+3 based on the aligned road width mentioned in the building Bye Laws Utrakhand clause 7.1. (ii).

Permitted Activities

1. Affordable Housing Projects under Housing policy
2. Government Housing Scheme
3. Retail Shop
4. Primary School (Minimum 12m wide approach roads only)
5. Anganwari Centre
6. Clinic / Dispensary
7. Bank / ATM
8. Police Station / Police Post
9. Public Library
10. Creche / Day Care / Kindergarden
11. Public Toilet / Community Toilet
12. Religious Building
13. Playground
14. Dairy Booth

Permitted by Board

1. Individual House
2. Multi-Storey Parking (Minimum 18m wide approach road)
3. Bus Stop
4. Taxi / Auto Stand (Applicable on a minimum 18m wide approach road)
5. Parking Space / Area
6. Electric Vehicle Charging Station
7. All Government/semi government Institutions/ Activities which contribute to public welfare, and does not have any adverse affect on its immediate surrounding, will be allowed through the concent report of Competent officer.
8. All the terms and conditions will be applicable along with the activities/land uses during the renewal/freehold lease of State Nazul Land (if applicable).

Commercial C1:

Built up Commercial

In this Landuse Maximum Building Height permitted will be G+2 based on the aligned road width mentioned in the building Bye Laws Uttarakhand clause 7.1. (ii).

Permitted Activities

1. Retail Shop
2. Private Office
3. Service Industry
4. Cottage and Household Industry (Maximum Plot area 200 sq m only)
5. Veterinary Dispensary / Hospital for pets only
6. Bank / ATM
7. Police Station / Police Post
8. Public Library
9. Public Toilet / Community Toilet
10. Religious Building
11. Gymnasium
12. Indoor Stadium
13. Bus Stop (Applicable on a minimum 18m wide approach road.)
14. Taxi / Auto Stand (Applicable on a minimum 18m wide approach road.)
15. Parking Space / Area
16. Electric Vehicle Charging Station
17. Dairy Booth

Permitted By Board

1. Hospital and Nursing Home (It must be on a minimum of 18m wide approach road only)
2. Diagnostic Centre/Other Medical Units
3. Swimming Pool
4. Hotel/ Lodge/ Restaurant/ Tourist unit as defined in building bylaws
5. Recreational Club (Minimum 18m wide approach road)
6. All Government/semi government Institutions/ Activities which contribute to public welfare, and does not have any adverse affect on its immediate surrounding, will be allowed through the concent report of Competent officer.
7. All the terms and conditions will be applicable along with the activities/land uses during the renewal/freehold lease of State Nazul Land (if applicable).

C2: Commercial Zone**Permitted Activities**

1. Retail Shop (As per Zoning Annexure I)
2. Daily need Shops
3. Wholesale (Maximum area 500 sq M)
4. Private Office
5. Shopping Mall
6. Multiplex Cinema

7. Service industry (As per Zoning Annexure III)
8. Clinic / Dispensary (maximum plot area 45 sq.m. only)
9. Primary / Community Health Centre (Govt. only)
10. Veterinary Dispensary / Hospital for pets only
11. Government Offices (It must be on minimum 18m wide approach road)
12. Bank / ATM
13. Police Station / Police Post
14. Guesthouse
15. Auditorium / Convention Centre
16. Art Gallery
17. Public Library
18. Public Toilet
19. Dharmashala
20. Religious Building
21. Recreational Club
22. Gymnasium
23. Dairy Booth

Permitted By Board

1. Hotel /Lodge / Restaurant/ Tourist unit as defined in building bylaws (Maximum Plot area 1000 sqm)
2. Hostel (Maximum Plot area 1000 sqm)
3. Petrol Pump / LPG filling station (It must be on a minimum of 24m wide approach road only. Applicant must obtain NOC for fire safety from the fire department)
4. Apartment / Flatted Housing (For studio apartments only)
5. Individual House (Only applicable to plot ≤ 90 m²)
6. Hospital and Nursing Homes (It must be on a minimum of 18m wide approach road only)
7. Diagnostic Centre/Other Medical Units
8. Multi-Storey Parking
9. Fire Station (Minimum 24m wide approach roads.)
10. Function Hall / Marriage Garden / Banquet Halls (Impact fee applicable)
11. Bus Stop (Applicable on a minimum 18m wide approach road.)
12. Taxi / Auto Stand (Applicable on a minimum 18m wide approach road.)
13. Electric Vehicle Charging Station
14. Parking Space / Area
15. All Government/semi government Institutions/ Activities which contribute to public welfare, and does not have any adverse affect on its immediate surrounding, will be allowed through the concent report of Competent officer.
16. All the terms and conditions will be applicable along with the activities/land uses during the renewal/freehold lease of State Nazul Land (if applicable).

C3: Wholesale Markets/ Mandis

Permitted Activities

1. Wholesale
2. Private Office (Maximum Area 45 sq m)
3. Clinic / Dispensary (maximum plot area 45 sq.m. only)
4. Bank / ATM
5. Police Station / Police Post
6. Public Toilet
7. Religious Building
8. Bus Stop (Applicable on a minimum 18m wide Master Plan/Existing road)
9. Taxi / Auto Stand(Applicable on a minimum 18m wide approach road)
10. Parking Space / Area
11. Dairy Booth

Permitted By Board

1. Warehouse (It must be on a minimum of 30m wide approach road only. Applicant must obtain NOC for fire safety from the fire department)
2. Storage Godown (It must be on a minimum of 30m wide approach road only. Applicant must obtain NOC for fire safety from the fire department)
3. Cold Storage (It must be on a minimum of 30m wide approach road only. Applicant must obtain NOC for fire safety from the fire department)
4. LPG Godown (Applicant must obtain NOC for fire safety from the fire department)
5. Petrol Pump / LPG filling station (It must be on a minimum of 30m wide approach road only. Applicant must obtain NOC for fire safety from the fire department.)
6. Retail Shop
7. Fire Station(Minimum 24m wide approach roads)
8. Multi-Storey Parking 9. Electric Vehicle Charging Station
10. All Government/semi government Institutions/ Activities which contribute to public welfare, and does not have any adverse affect on its immediate surrounding, will be allowed through the concent report of Competent officer.
11. All the terms and conditions will be applicable along with the activities/land uses during the renewal/freehold lease of State Nazul Land (if applicable).

C4: Warehouse/Godown**Permitted Activities**

1. Storage Godown
2. Warehouse
3. Cold Storage
4. Retail Shop
5. Clinic / / Dispensary (maximum plot area 45 sq.m. only)
6. Bank / ATM
7. Police Station / Police Post
8. Public Toilet
9. Religious Building

10. Bus Stop (Applicable on a minimum 18m wide approach road)
11. Weight Bridge
12. Dairy Booth

Permitted By Board

1. Fire Station (Minimum 24m wide approach roads)
2. Petrol Pump / LPG filling station (It must be on a minimum of 45m wide approach road only. Applicant must obtain NOC for fire safety from the fire department)
3. LPG Godown (Applicant must obtain NOC for fire safety from the fire department)
4. Any Storage Godown/ warehouses for Perishable and Hazardous material
5. Taxi / Auto Stand (Applicable on a minimum 18m wide approach road)
6. Parking Space / Area
7. Electric Vehicle Charging Station
8. All Government/semi government Institutions/ Activities which contribute to public welfare, and does not have any adverse affect on its immediate surrounding, will be allowed through the consent report of Competent officer.
9. All the terms and conditions will be applicable along with the activities/land uses during the renewal/freehold lease of State Nazul Land (if applicable).

Mixed M1: Residential and Commercial**Permitted Activities**

All activities listed in permitted category of Residential Zone (R3) and commercial Zone (C2)

Permitted By Board

All activities listed in permitted by board category of Residential Zone (R3) and Commercial Zone (C2) Conditions for Other Permitted activities for Mixed Land use

- If more than 50% of the plot area is falling under mixed use, will be treated as mixed land use with the satisfactory consent report given by the Town and Country Planning Department.

M2: High Rise Building Zone**Permitted Activities**

All activities listed in permitted category of Residential Zone (R3) and commercial Zone (C2) but in vertical Mix Only

Permitted By Board

All activities listed in permitted by board category of Residential Zone (R3) and Commercial Zone (C2) but in vertical Mix Only. In addition to that Board can decide the vertical mixing following activities with the consent of Chief Town and Country Planner.

- Residential / Commercial – Multi-story buildings with residential units above and commercial units on the ground floor facing the street
- Urban Residential / Commercial – multi-story residential buildings with commercial and civic uses on the ground floor
- Office Convenience – office buildings with small retail and service uses oriented to the office workers.
- Office / Residential – multi-family residential units within office building(s).
- Shopping mall conversion – residential and/or office units added (adjacent) to an existing standalone shopping mall.

- Retail District Retrofit – retrofitting of a suburban retail area to a more village-like appearance and mix of uses
- Live / Work – residents can operate small businesses on the ground floor of the building where they live
- Studio / Light industrial – residents may operate studios or small workshops in the building where they live
- Hotel/ Residence – mix hotel space and high-end multi-family residential
- Parking structure with ground-floor retail
- Single-family detached home district with standalone shopping center I: Industry

Permitted Activities

1. Manufacturing (It must be on minimum 18m wide approach road. Applicant must obtain NOC from SPCB for pollution)
2. Service Industry
3. Chemical (It must be on minimum 18m wide approach road. Applicant must obtain NOC from SPCB for pollution)
4. Pharmaceutical (It must be on minimum 18m wide approach road. Applicant must obtain NOC from SPCB for pollution)
5. Textile (It must be on minimum 18m wide approach road. Applicant must obtain NOC from SPCB for pollution)
6. Agro based & Food Processing
7. Obnoxious (It must be on minimum 18m wide approach road. Applicant must obtain NOC from SPCB for pollution)
8. Cottage and Household
9. Individual House(Only applicable to plot ≤ 90 m²)
10. Retail Shop
11. Clinic /Dispensary (maximum plot area 45 sq.m. only)
12. Bank / ATM
13. Police Station / Police Post
14. Public Toilet /
15. Religious Building
16. Fire Station (Minimum 24m wide approach roads)

Permitted By Board

1. Warehouse (It must be a minimum of 30 m wide road)
2. Storage Godown (It must be a minimum of 30 m wide road)
3. Cold Storage ((It must be a minimum of 30 m wide road)
4. Petrol Pump / LPG filling station (It must be on a minimum of 30m wide approach road only. Applicant must obtain NOC for fire safety from the fire department)
5. Bus Stop
6. Taxi / Auto Stand
7. Parking Space / Area
8. Multi-Storey Parking

9. Electric Vehicle Charging Station

10. Weight Bridge

11. Dairy Booth

12. All Government/semi government Institutions/ Activities which contribute to public welfare, and does not have any adverse affect on its immediate surrounding, will be allowed through the concent report of Competent officer.

13. All the terms and conditions will be applicable along with the activities/land uses during the renewal/freehold lease of State Nazul Land (if applicable).

Public and Semi-Public

PS1: Govt./ Semi Govt./ Public Office

Use Zone

Permitted Activities

1. Government Offices
2. Government Quarter
3. Bank / ATM
4. Police Station / Police Post
5. Auditorium / Convention Centre
6. Art Gallery
7. Public Library
8. Public Toilet /
9. Fire Station (Minimum 24m wide approach roads)
10. Religious Building
11. Retail Shop
12. Private Office (The plot area must not be larger than 45 sq.m.)
13. Playground
14. Swimming Pool
15. Indoor / Outdoor Stadium
16. Dairy Booth
17. Police lines

Permitted by Board

1. Bus Stop
2. Taxi / Auto Stand
3. Parking Space / Area
4. Multi-Storey Parking
5. Electric Vehicle Charging Station
6. Government Housing Scheme
7. All Government/semi government Institutions/ Activities which contribute to public welfare, and does not have any adverse effect on its immediate surrounding, will be allowed through the concent report of Competent officer

8. All the terms and conditions will be applicable along with the activities/land uses during the renewal/freehold lease of State Nazul Land (if applicable).

PS1B: Central Govt. Institute/ Office Area

All Zoning Regulations and Building permission will be given by Central Government as per prevailing guidelines.

PS2: Educational and Health Zone**Permitted Activities**

1. School
2. College
3. University
4. Research and Development Centre
5. Vocational Institute / Training Institute / Research Centre
6. Anganwari Centre
7. Hospital and Nursing Home
8. Diagnostic Centre/Other Medical Units
9. Clinic / Dispensary
10. Primary / Community Health Centre (Govt. only)
11. Bank / ATM
12. Police Station / Police Post
13. Auditorium / Convention Centre
14. Art Gallery
15. Public Library
16. Creche / Day Care / Kindergarden
17. Public Toilet
18. Playground
19. Sports Centre/Complex
20. Indoor / Outdoor Stadium
21. Dairy Booth

Permitted by Board

1. Orphanage / Old Age Home/Home for Handicapped Children
2. Retail Shop
3. Private Office (The plot area must not be larger than 45 sq.m.)
4. Government Offices
5. Government Quarter
6. Fire Station (Minimum 24m wide approach roads)
7. Religious Building
8. Bus Stop
9. Taxi / Auto Stand
10. Parking Space / Area

11. Multi-Storey Parking

12. Electric Vehicle Charging Station

13. All Government/semi government Institutions/ Activities which contribute to public welfare, and does not have any adverse affect on its immediate surrounding, will be allowed through the concent report of Competent officer.

14. All the terms and conditions will be applicable along with the activities/land uses during the renewal/freehold lease of State Nazul Land (if applicable).

PS3: Socio-cultural and Religious Zone

Permitted Activities

1. Community Hall (It must be on minimum 18m wide road)
2. Art Gallery
3. Public Library
4. Public Toilet
5. Orphanage / Old Age Home/Home for Handicapped Children
6. Dharmashala / Night Shelter
7. Bank / ATM
8. Police Station / Police Post
9. Fire Station (Minimum 24m wide approach roads)
10. Religious Building
11. Retail Shop
12. Playground
13. Dairy Booth

Permitted by Board

1. Crematorium Burial Ground / Grave Yard / Incinerator
2. Sports Centre/Complex
3. Indoor / Outdoor Stadium
4. Bus Stop
5. Taxi / Auto Stand
6. Parking Space / Area
7. Multi-Storey Parking
8. Electric Vehicle Charging Station
9. All Government/semi government Institutions/ Activities which contribute to public welfare, and does not have any adverse affect on its immediate surrounding, will be allowed through the concent report of Competent officer.
10. All the terms and conditions will be applicable along with the activities/land uses during the renewal/freehold lease of State Nazul Land (if applicable).

Recreational

P1: Play Ground

Permitted Activities

1. Playground

2. Public Toilet
3. Park
4. Outdoor gym

Permitted by Board

1. Mela ground
2. All Government/semi government Institutions/ Activities which contribute to public welfare, and does not have any adverse affect on its immediate surrounding, will be allowed through the concent report of Competent officer.
3. All the terms and conditions will be applicable along with the activities/land uses during the renewal/freehold lease of State Nazul Land (if applicable).

P2: Multipurpose Open Spaces**Permitted Activities**

1. Playground
2. Shooting range
3. Open air theatre
4. Multipurpose recreational park/special recreational and educational park
5. Temporary use (trade fair/circus/exhibition place)
6. Rescue Pockets during any Hazard or disaster occurrence

Permitted by Board

1. Police post/fire post/structure related to utility services
2. Public Toilet
3. Bus Stop
4. Taxi / Auto Stand
5. Parking Space / Area
6. Electric Vehicle Charging Station
7. All Government/semi government Institutions/ Activities which contribute to public welfare, and does not have any adverse affect on its immediate surrounding, will be allowed through the concent report of Competent officer.
8. All the terms and conditions will be applicable along with the activities/land uses during the renewal/freehold lease of State Nazul Land (if applicable).

P3: Horticulture/Botanical Garden**Permitted Activities**

1. Horticulture Gardens
2. Botanical Garden
3. Playground
4. Shooting Range

Permitted by Board

1. Sports Centre/Complex
2. Swimming Pool
3. Golf Course / Race Course

4. Zoo
5. Associated Research and Development Centre
6. Public Toilet / Community Toilet
7. Bus Stop
8. All Government/semi government Institutions/ Activities which contribute to public welfare, and does not have any adverse affect on its immediate surrounding, will be allowed through the concent report of Competent officer.
9. All the terms and conditions will be applicable along with the activities/land uses during the renewal/freehold lease of State Nazul Land (if applicable).

Green Zone**G1: Parks****Permitted Activities**

1. Park
2. Outdoor Gymnasim
3. Botanical Garden
4. Picnic spot
5. Open air theater

Permitted by Board

1. Water park
2. Amusement Park
3. Theme park
4. Golf course
5. Public Toilet
6. Parking
7. Structure associated to utility services

G2: Green Belt Along Natural Drain**Permitted Activities**

1. Park
2. Garden
3. Plantation
4. Afforestation
5. Nursery
6. Picnic spot

Permitted by Board

1. Public Toilet
2. Structure associated to utilities

Traffic and Transportation**T1: Roads****Permitted Activities**

1. Bus Stop

Permitted By Board

1. Street vending Zone
2. Parking Space / Area
3. Public Toilet

T3: Bus Stand

Permitted Activities

1. Bus Parking / Bus Bays
2. Bus Stop
3. Parking Space
4. Electric Vehicle Charging Station
5. Public Toilet

Permitted by Board

1. Bus Depot/ Workshop
2. Auto/ Taxi Stand
3. Retail Shop
4. ATM
5. Dairy Booth
6. PPP Mode Bus Terminal with Mix of Commercial and Terminal facilities

T4: Transport Nagar / Truck Terminal

Permitted Activities

1. Booking offices
2. Loading/ Unloading Spaces
3. Weight Bridge
4. Parking Space / Area
5. Electric Vehicle Charging Station

Permitted by Board

1. Warehouse (It must be a minimum of 30 m wide road)
2. Storage Godown (It must be a minimum of 30 m wide road)
3. Cold Storage ((It must be a minimum of 30 m wide road)
4. Petrol Pump / LPG filling station (It must be on a minimum of 30m wide approach road only. Applicant must obtain NOC for fire safety from the fire department)
5. Retail Shop
6. Bus Stop
7. Taxi / Auto Stand
8. Dairy Booth
9. All Government/semi government Institutions/ Activities which contribute to public welfare, and does not have any adverse affect on its immediate surrounding, will be allowed through the concent report of Competent officer

10. All the terms and conditions will be applicable along with the activities/land uses during the renewal/freehold lease of State Nazul Land (if applicable)

Primary Activity

PA: Agriculture

Permitted Activities

1. Nursery
2. Dairy Booth
3. Milk Collection Centre
4. Biogas Plant
5. Scrap yard
6. Public Toilet
7. Parking Space / Area
8. Dairy farm / Gaushala
9. Poultry farm
10. Private Garage
11. Weight Bright (Minimum 30m wide road)
12. Cottage and Household industry
13. Animal Husbandary

Permitted by Board

1. shopping mall (Minimum 45m wide road and outside of municipal limit only) (Imapct Fee Applicable)
2. Multiplex / Cinema (Minimum 45m wide road and outside of municipal limit only) (Imapct Fee Applicable)
3. Function Hall / Marriage Garden / Banquet Halls (Minimum 30m wide road and outside of municipal limit only) (Imapct Fee Applicable)
4. Storage Godown fpr Agriculture Products only
5. Petrol Pump / LPG filling station (45 M Wide Road)
6. LPG Godown
7. School (Minimum 12m wide approach roads)
8. College (on 30 M wide Road)
9. Research and Development Centre (on 30 M wide Road)
10. Vocational Institute / Training Institute / Research Centre (on 30 M wide Road)
11. Anganwari Centre
12. Clinic / Dispensary (maximum plot area 45 sq.m. only)
13. Primary / Community Health Centre (Govt. only)
14. Veterinary Dispensary / Hospital for Catttles Only
15. Police Station / Police Post 16. Crematorium Burial Ground / Grave Yard / Incinerator
17. Orphanage / Old Age Home/Home for Handicapped Children
18. Fire Station (24 M wide Road)
19. Religious Building

20. Sports Centre/Complex (24 M wide Road)
21. Swimming Pool
22. Golf Course / Race Course
23. Brick kiln as per NGT Norms
24. Individual House/Farm House (maximum 250 sq.m./35%ground coverage whichever is larger)
25. Slaughter House (The competent authority must verify that it is not affecting the existing surrounding areas/ proposed areas)
26. Amusement Park (Minimum 30m wide road) (Imapct Fee Applicable)
27. Shooting Range (Minimum 30m wide road)
28. Bus Stop 29. Taxi / Auto Stand
30. Hospital (Hospitals for mentally restarted patients and infectious diseases)
31. Diagnostic Centre/Other Medical Units (Hospitals for mentally restarted patients and infectious diseases)
32. Electric Vehicle Charging Station
33. Mining (RBM), stone crusher (Imapct Fee Applicable)
34. Zoo/zoological park/botanical garden
35. Jail
36. Reformatory house
37. All Government/semi government Institutions/ Activities which contribute to public welfare, and does not have any adverse affect on its immediate surrounding, will be allowed through the concent report of Competent officer.
38. All the terms and conditions will be applicable along with the activities/land uses during the renewal/freehold lease of State Nazul Land (if applicable).

Protected Areas

E1: Water Bodies

All the water Bodies, On Ground Existing on ground/ as per revenue records will be treated as water bodies, Green belt will be applicable as per the clause 4.4 (iii) mentioned in building bye laws

E2: Vegetation

Permitted Activities

1. High density Plantation
2. Nursery
3. Playground
4. Sports Centre/Complex
5. Swimming Pool
6. Indoor / Outdoor Stadium
7. Golf Course / Race Course
8. Shooting Range
9. Zoo

Permitted by Board

1. Public Toilet
2. Structure associated to utilities

E3: Eco – sensitive Zone

No new Construction (other than Existing) is allowed from the 100 meters from the boundary of Eco- sensitive Zone

SA- Special Area**TG- Tea Garden**

Any activity other than Tea plant cultivation and related activities is not allowed in the Tea Garden Zone

Permitted

1. Tea Garden
2. Gardens
3. Nursery
4. Horticulture
5. Tea Plantation

Permitted By Board

1. Tea processing Building, Maximum Ground Coverage of 250 sq.m and Building height including pitch route 12.5 m
2. Other corresponding uses which is essential for the development of the area and is equivalent to any of the above-described use.

TZ- Tourism Zone

All other use under tourism use which is not equivalent to the above-described permissible use.

Permitted

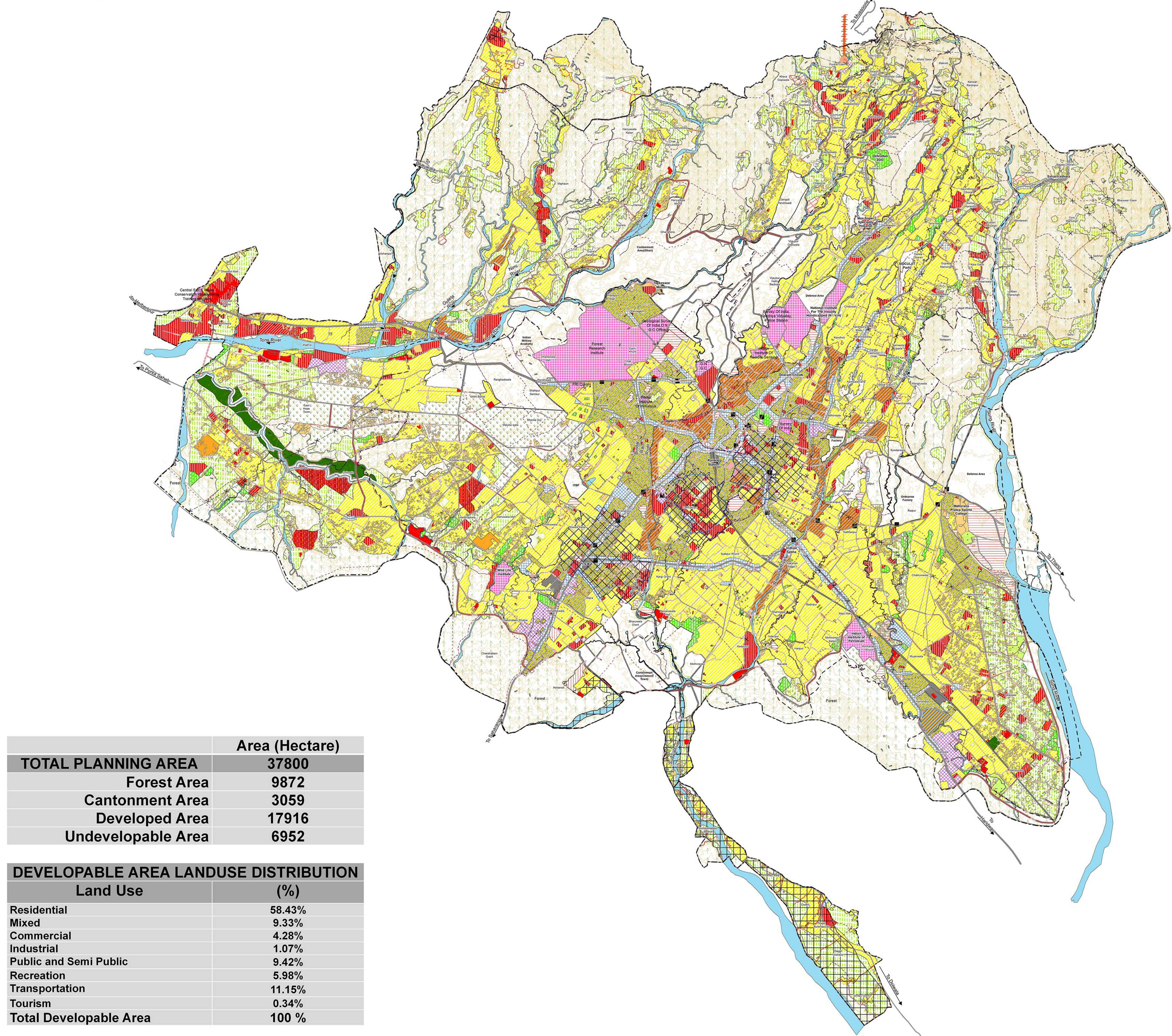
1. Tourist residence
2. Cottages, lodges
3. Rest house
4. Camping
5. Hamlet huts
6. Youth hostel
7. Motel
8. Hotel
8. Mall
9. Multiplexes
10. Shopping area
11. Spa
12. Urban art
13. Craft art centre
14. Tourist village
15. Sell and exhibition site
16. Planetarium

17. Aquarium
18. Community building
19. Cultural building
20. Park,
21. Playground
22. Science and adventure park
23. Amusement Park
24. Museum
25. Golf club
26. Club house
27. Gymnasium
28. Skating ring
29. Boating club
30. Theatre
31. Tracking institute
32. Art gallery
33. Yoga and health centre
34. Bank
35. Primary health centre
36. Taxi stand
37. Bus depot
38. Rope way
39. Parking
40. Music centre
41. Tourist office
42. Transport booking centre
43. Travelling agency's office
44. Artificial water body.
45. Impact fees on hotel

Permitted by Board

1. Radio broadcasting centre
2. Television studio and sound recording and dubbing studio
3. Filling studio, water and electricity distributing office
4. Information technology related building
5. Telephone centre
6. Post and wireless house
7. Police check post.
8. The uses according to the tourism which is essential for the development of the area and is equivalent to any of the above-described use.

देहरादून महायोजना- 2041(प्रारूप) पर जनसामान्य/अभिकरणों से आपत्ति/सूझाव आमंत्रण



	Area (Hectare)
TOTAL PLANNING AREA	37800
Forest Area	9872
Cantonment Area	3059
Developed Area	17916
Undevelopable Area	6952

Land Use	(%)
Residential	58.43%
Mixed	9.33%
Commercial	4.28%
Industrial	1.07%
Public and Semi Public	9.42%
Recreation	5.98%
Transportation	11.15%
Tourism	0.34%
Total Developable Area	100 %

Dehradun Master Plan- 2041

Proposed Land Use

Legend

- Planning Area Boundary
- Municipal Corporation Boundary
- Village Boundary
- LAP Area Boundary
- NH- National Highway
- SH- State Highway
- Major City Road
- Existing Road
- Proposed Road
- Metro Alignment & Station
- Ropeway Alignment & Station
- Contour
- Fault Line

Proposed Land Use

Developable Area

Residential

- R1 Builtup Residential
- R2 Residential Zone
- R3 Affordable Housing Zone

Commercial

- C1 Commercial Zone
- C2 Wholesale Markets/ Mandis/ Warehouse/ Godowns

Mixed Use

- M1 Residential & Commercial
- M2 High Rise Building Zone
- M3 TOD Zone

Industrial

Public & Semi-Public

- PS1 Govt/Semi Govt/Public Office Zone
- PS2 Education Zone
- PS3 Health Zone
- PS4 Socio-Cultural & Religious Zone

Utilities and Services

- FS Fire Station
- CR Crematorium/ Burial Ground/ Grave Yard
- ESS Electric Sub-Station
- SWM Solid Waste Management
- STP Sewage Treatment Plant

Water Treatment Plant

Recreational

- P1 Play Ground/ Stadium
- P2 Multi-Purpose Open Space

Green Zone

- G1 Parks
- G2 Green Belt

Transportation

- T1 Roads
- T2 Railway Area
- T3 Bus Stands/ Railway Stations
- T4 Transport Nagar/ Truck Terminal

Special Area

- Tourism
- Tea Garden
- Central Govt Institute/ Office Areas

Undevelopable Area

Primary Activity

Protective Zone

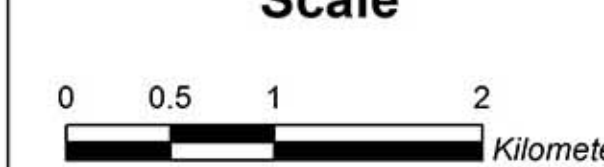
- E1 Existing / Revenue Water Bodies
- E2 Eco Sensitive Zone

Deviated Building/ Area from Zonal Plan

- DR Mixed(Residential/Commercial)
- DPS Deviated Public/Semi-Public

1:36,352

Scale



N

North Arrow



sd /

Town & Country Planning Department
Government of Uttarakhand

Consultant: MaRS Planning & Engineering Services Pvt. Ltd.